DRE-130

Technical Memorandum

Okeechobee County Airport Landfill

Investigaiton Pilot Study

December, 1986

TECHNICAL MEMORANDUM

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OKEECHOBEE COUNTY
AIRPORT LANDFILL INVESTIGATION
PILOT STUDY

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Jeffry W. Herr

South Florida Water Management District

Resource Planning Department

Water Quality Division

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EXECUTIVE SUMMARY

The South Florida Water Management District (SFWMD) conducted a study of the Okeechobee County Airport Landfill from December 1984 to July 1985. The purpose of this study was to determine the effectiveness of various monitoring procedures and to determine the extent of ground water contamination in the vicinity of the landfill and whether leachate plumes were emanating from the landfill.

Specially designed monitor wells were installed to obtain representative water samples from both a shallow and a deep horizon, and to monitor water levels. A total of 14 wells were installed, sampling 11 locations surrounding the landfill. In addition, 7 previously constructed monitor wells were used in the study.

Non-contacting electromagnetic (EM) terrain conductivity meters (Geonics EM-31 and EM-34) were used to conduct an electromagnetic survey of the landfill and surrounding areas. EM surveys can be used to show changes in resistivity which indicate changes in water quality. Therefore, resistivity surveys can be used to help locate leachate plumes.

Extensive ground water quality sampling was also conducted to characterize the water quality emanating from the landfill. A comprehensive suite of parameters were analyzed. These included physical parameters, major anions and cations, nutrients, trace metals, and 130 organic compounds from the EPA priority pollutant list.

The study showed that both EM surveying and monitor well installation techniques offer distinct advantages and disadvantages. The advantages of an EM survey include the low cost of the instrument and the ease and speed of obtaining results from direct readings taken in the field. Disadvantages include that the results provide only an indication of relative water quality and cannot detect organic compounds. Additionally, EM readings may be affected by several factors not related to water quality. A monitoring well network has the advantage of quantifying concentrations of specific compounds present in the aquifer. Monitor well installation also provides geologic information at the site. Once completed, monitor wells can be used for collecting water levels which are used to determine ground water flow. The major disadvantage of the monitor well network is the expense and time involved in well installation and sample analyses. Ideally, both methods can be used in conjunction to maximize their strengths and minimize their weaknesses.

Data collected from the Okeechobee County Airport Landfill shows the ground water quality to be degraded in the vicinity of the landfill, with a broad leachate plume moving to the southwest, south, and southeast. Primary and secondary drinking water standards were exceeded by several compounds in the leachate plume. The concentration of most contaminants decreases significantly with increased distance from the landfill.

INTRODUCTION

Purpose and Scope

The SFWMD in conjunction with the Florida Department of Environmental Regulation (FDER) is developing accurate and cost-effective methods of studying ground water contamination in south Florida. Various pilot sites were selected to evaluate the requirements needed to study sources of pollution. The closed Okeechobee County Airport Landfill was chosen for a pilot site study to evaluate a representative abandoned landfill in south Florida. The purpose of the study was to determine the extent of ground water contamination in the vicinity of the landfill and whether leachate plumes were emanating from the landfill.

Location

The Okeechobee County Airport Landfill is a 40 acre site located in the southern portion of Okeechobee County, approximately 2 miles northwest of the City of Okeechobee. It occupies approximately one-third of the western half of Section 8, Township 37 South, Range 35 East, and is north of N. W. 20th Trail (formerly Airport Road) between State Road 98 and the Okeechobee County Airport (Figure 1).

The Okeechobee County Airport Landfill was selected for a pilot study because it is a moderately sized, closed landfill, that was open for 20 years from 1960 to 1980. A variety of wastes were disposed of on site, as is typical of many abandoned landfills in south Florida. The landfill and most of the surrounding land is owned by Okeechobee County, thus allowing access for studying the site and installing monitor wells. Monitor wells installed during the study may be used by Okeechobee County for their DER compliance monitoring upon completion of the study. Some historical water quality and water level data was available, however, no geophysical work had previously been conducted on leachate plume detection at the site. Residences and businesses are within half a mile of the landfill and use well water.

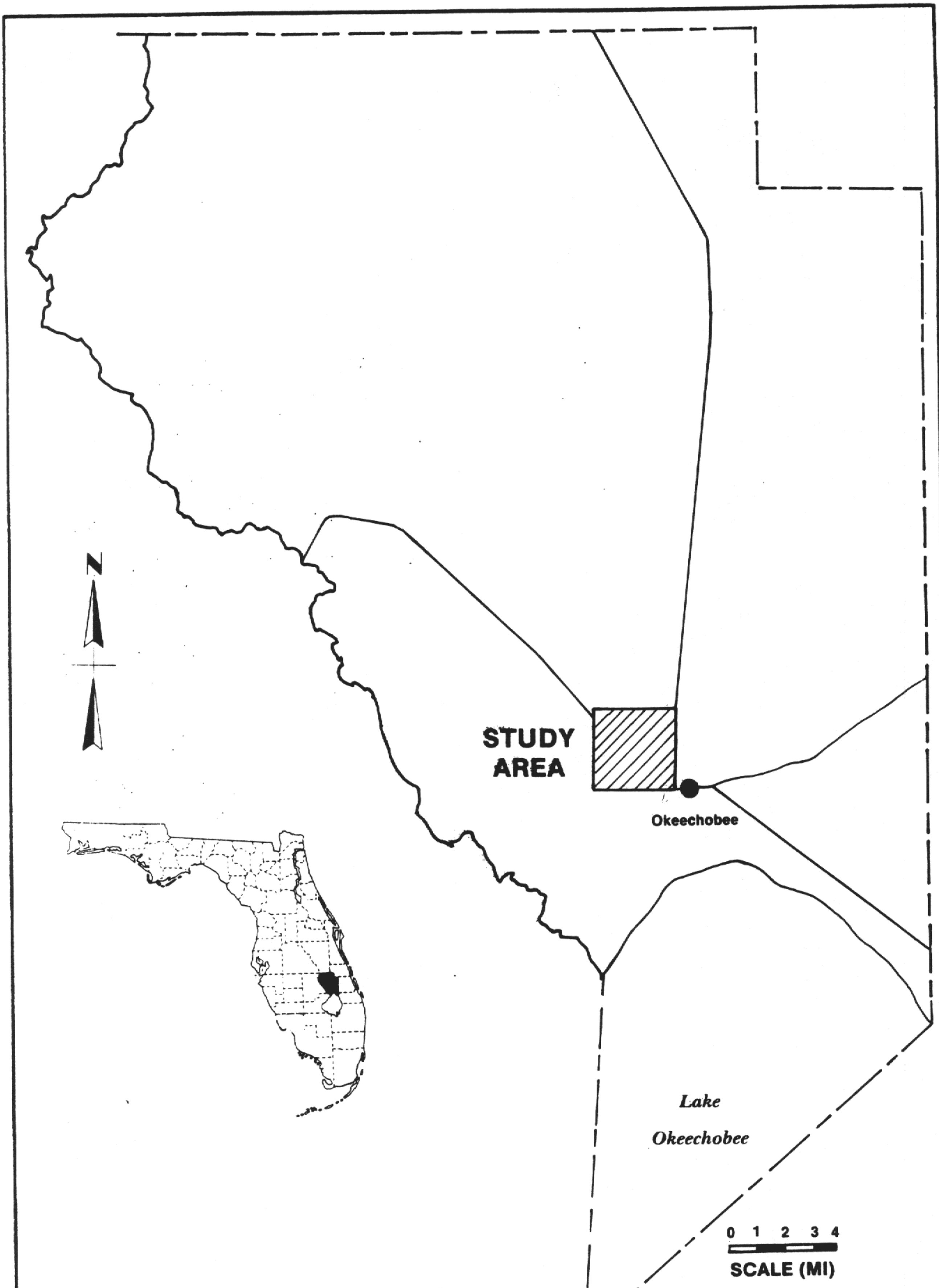


FIGURE 1 Location of the Study Area

Characterization of a leachate plume would indicate whether there is a potential for contamination of these wells.

Rainfall

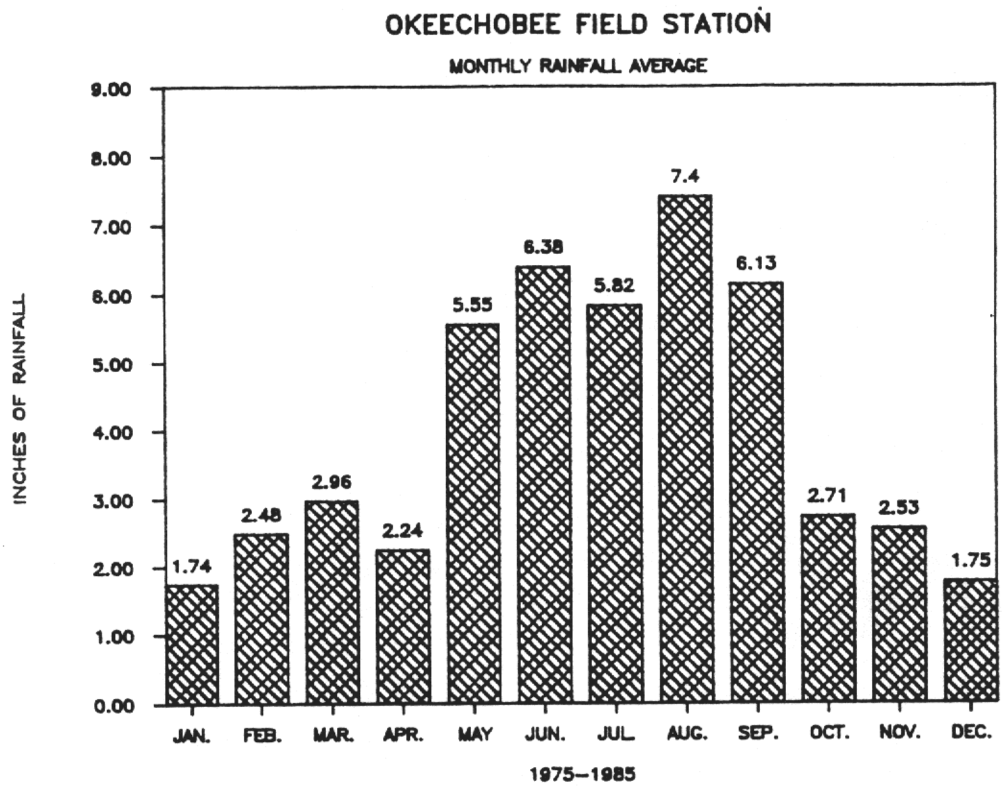
Figure 2 shows two hydrographs displaying monthly rainfall at the SFWMD's Okeechobee Field Station. This field station is located four miles east of the landfill. The first hydrograph shows the monthly rainfall average for the ten year period between 1975 and 1985. The second hydrograph shows the monthly rainfall during 1985.

The average rainfall at the Okeechobee Field Station from 1975-1985 was 47.7 inches per year. Assuming normal rainfall for December, the total precipitation for 1985 will be 44.4 inches, 3.3 inches below normal. The rainy season extends from May to September. This five month period on average accounts for 66 percent of the rainfall in 41 percent of the time. During 1985, 72 percent of the precipitation occurred during the rainy season.

Landfill Characteristics

The Okeechobee County Airport Landfill is a Class I landfill that began operation in 1960 and ceased in December 1980. The landfill served a population of approximately 13,000 people, and accepted a variety of wastes including solid wastes from agricultural, residential, commercial, and industrial sources; domestic and septic tank sludges; and pathological/infectious agents. It was unlined and did not have a weight scale, leachate discharge system, or gas control system. It was open Monday through Saturday and had an attendant on duty during open hours.

Upon closure, the landfill was capped with sand, but in some areas, small amounts of debris were visible. There is considerable relief along the eastern portion of the landfill where the waste disposal trenches were covered.



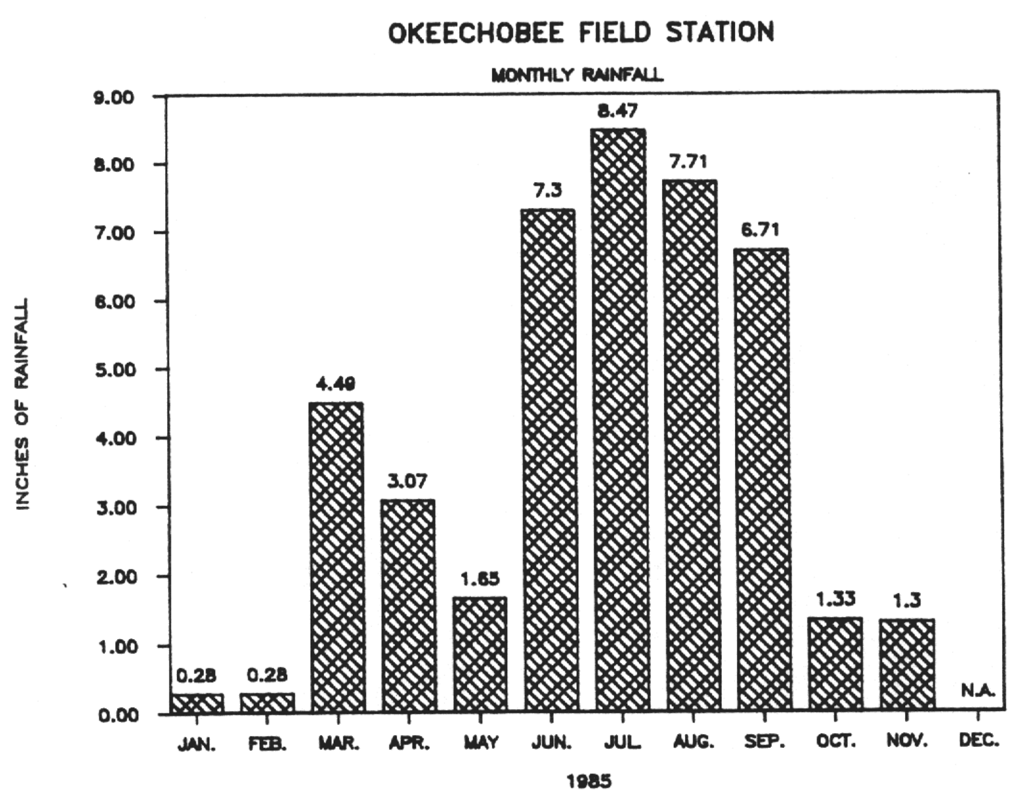


FIGURE 2 Rainfall Data from Okeechobee Field Station

Land Use in Surrounding Area

Figure 3 shows the land use surrounding the landfill. The Okeechobee County Airport lies immediately east of the landfill. Several buildings associated with the airport are within 600 feet of the eastern boundary of the landfill. These buildings contain offices, mechanic service bays, and one above-ground fuel storage tank. A water supply well for the airport is approximately 400 feet southeast of the landfill. South of the airport there is an industrial park which is being developed. West of the landfill there are several small businesses, and to the north, there is a 40 acre field owned by the county but leased for cattle grazing. There are residential areas less than a mile from the landfill to the north, the west, and the south. The Okeechobee County Humane Society is immediately south of the landfill.

The industrial park and the southern housing development are connected to the City of Okeechobee public water supply system (Figure 4). The majority of the remaining homes and businesses use well water from the surficial aquifer.

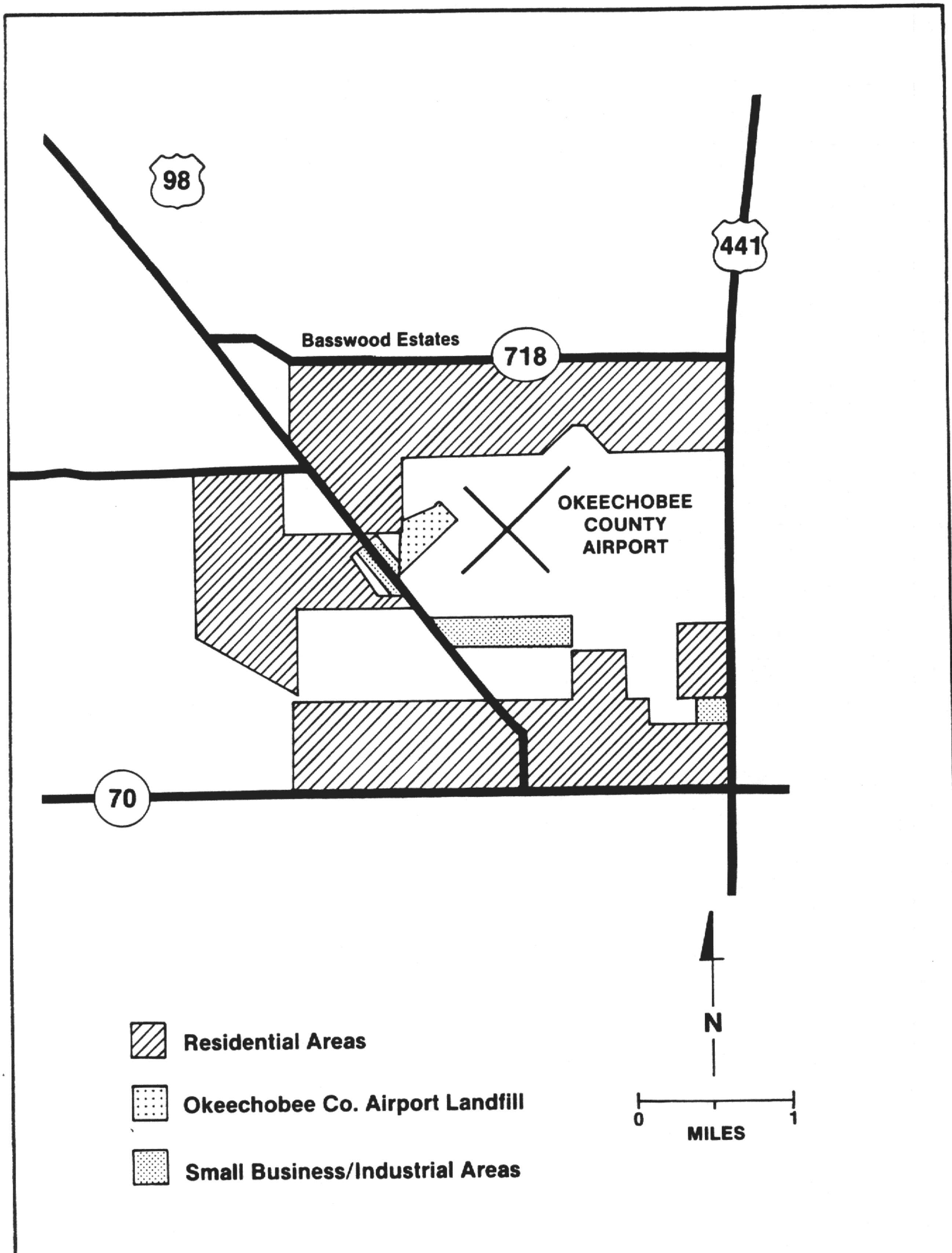


FIGURE 3 Land Use in the Study Area

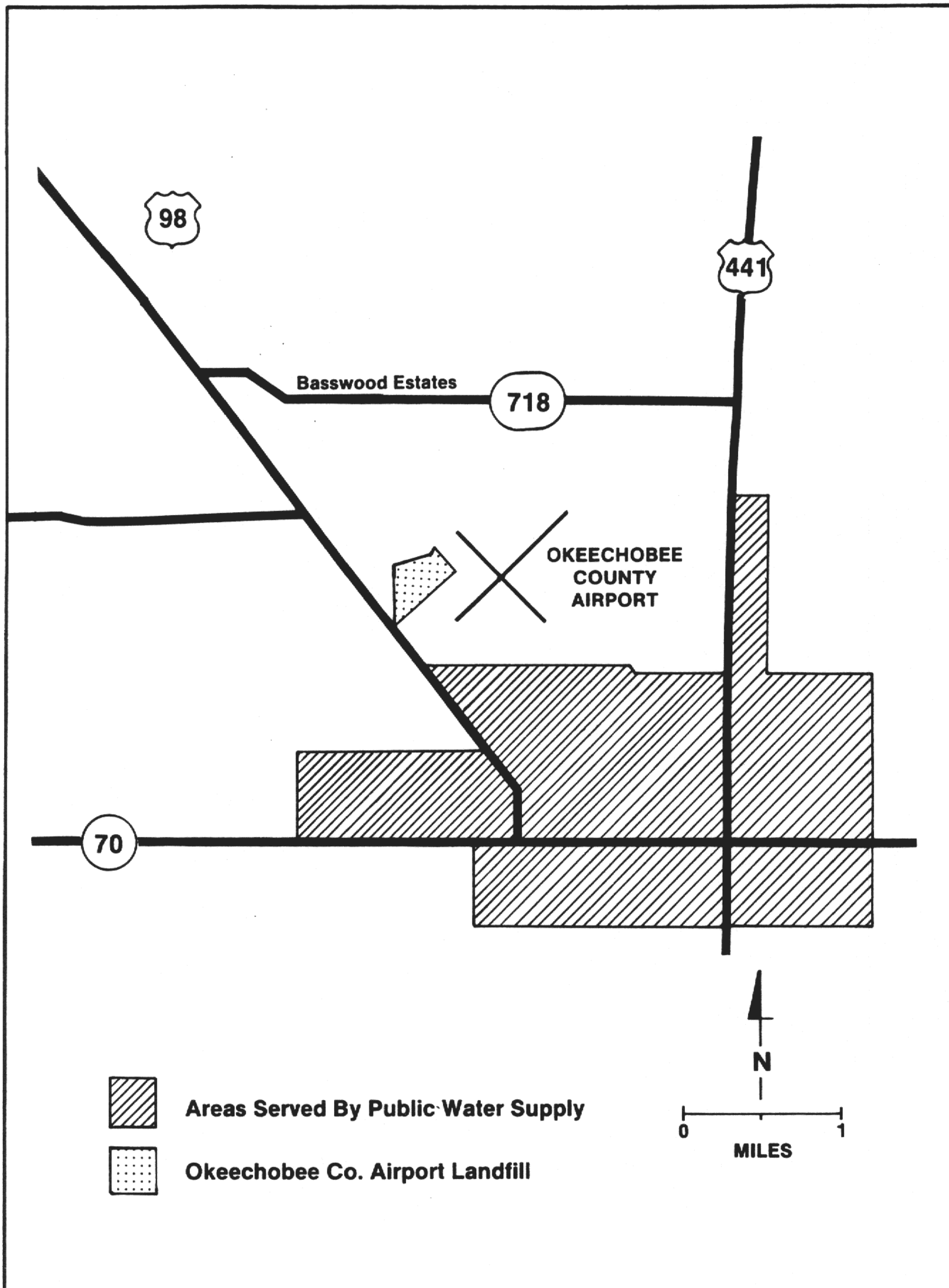


FIGURE 4 Areas Served by Public Water Supply Systems

METHODOLOGY

The study of this landfill included the sampling of 14 newly installed ground water monitor wells, and seven ground water monitor wells previously installed by Okeechobee County. All ground water monitor wells were surveyed for location and elevation. Water level measurements were taken in both the wet and dry seasons in order to determine the direction of ground water flow and seasonal variations. Geophysical surveys were conducted to determine both the areal and vertical extent of any leachate plumes.

The landfill study began in December 1984 and concluded in July 1985. Water samples were collected from the monitor wells in December 1984, February 1985, and April 1985. Water level readings were taken in February, April, and July of 1985. Electromagnetic terrain conductivity measurements were taken in January of 1985.

Monitor Well Construction

Single and cluster monitor wells were installed by the SFWMD at the Okeechobee County Airport Landfill. Eight site locations surrounding the landfill were selected for single well installation. Six cluster wells were installed at three separate locations surrounding the landfill.

Both the single and cluster monitor wells that were installed at the Okeechobee County Airport Landfill by the SFWMD are cased with two inch schedule 80 threaded PVC. The screens are five foot lengths of threaded schedule 80 slot 20 PVC screens. The wells were drilled using a hollow stem auger, the casing and screen were set through the hollow center of the auger, and a gravel pack (consisting of 20-30 silica sand) was then added through the annulus between the casing and the inside of the auger. The auger flights, casing, and screen were all steam cleaned prior to installation. The gravel pack extends from one foot below the base of the screen to two feet above the top of the screen. The well was then grouted to land surface with pure portland cement and a locking steel protective cover was cemented in place to prevent vandalism and tampering. A cement collar was installed around the well and protective cover to prevent ponding and/or infiltration of runoff. One-eighth inch drain holes were drilled in the protective cover to allow any rainwater which might enter to drain (Figure 5).

At selected drill sites close to the landfill, cluster wells consisting of one shallow and one deep well were drilled. The deep well was installed as above, however, it was grouted from the top of the gravel pack to four feet below the lowest expected dry season water level. Two feet of sand was added on top of the cement. The shallow well casing was then installed and gravel packed. A large diameter, 8 to 10 inch steel protective cover was then cemented over both wellheads (Figure 6). Monitor well construction data is given in Appendix I.

Well Cutting Description

Cuttings were collected from eight wells and examined with the aid of a binocular microscope. Descriptions were based on color (using the GSA Munsell chart), estimated porosity, type of porosity, estimated permeability, induration, cement type, type and percent of accessory minerals, and fossil content. Observations were made concerning grain size range, roundness of grains, sphericity, and, if applicable, cement type. The mode and range for the grain sizes were estimated with the aid of a printed scale. Hydrochloric acid was used to estimate the calcium carbonate content of the cuttings.

Observations were made on standardized sample description forms developed by the Florida Bureau of Geology for the computer storage and retrieval of lithologic data. The Florida Bureau of Geology computer data base program was adapted to the computer system at the SFWMD and used in this study. The lithologic descriptions are listed in Appendix II.

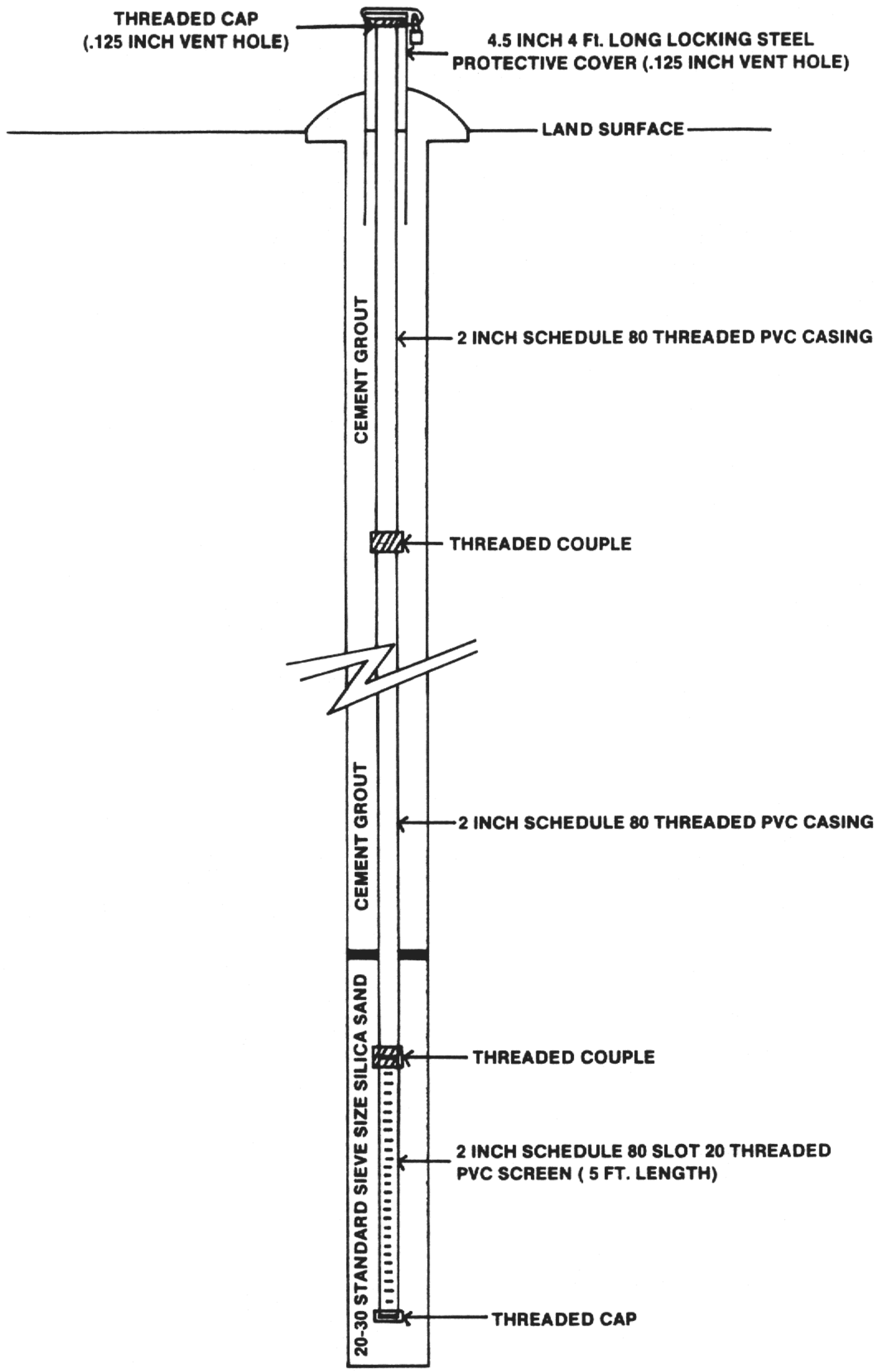


FIGURE 5 Well Construction Diagram, Single Well

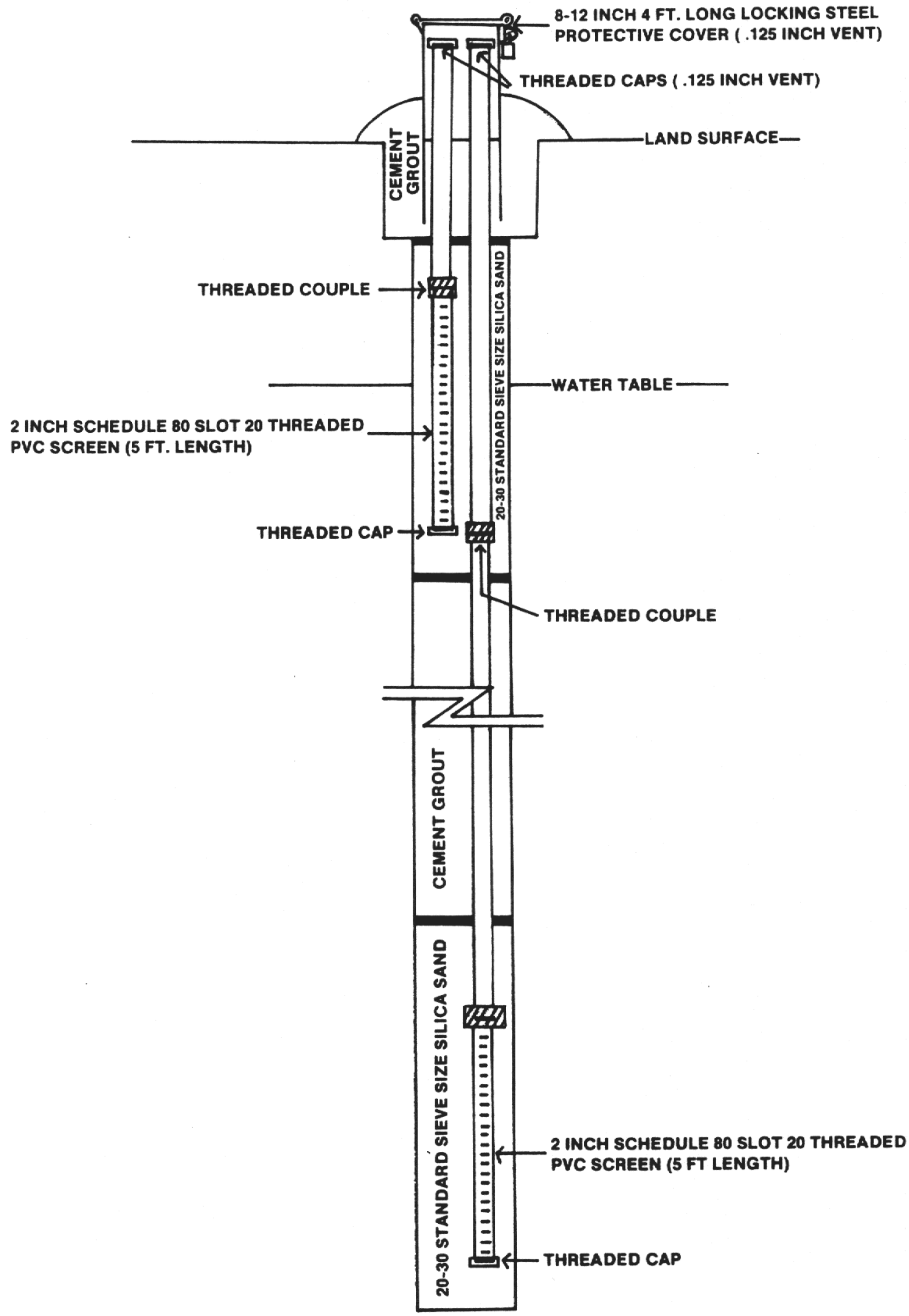


FIGURE 6 Well Construction Diagram, Cluster Well

Well Location

The locations of the monitor wells installed by the SFWMD are shown in Figure 7. Single wells 29, 35, 39, 41, and cluster wells 36 and 37 were installed near previous monitor wells that no longer yield water, or that yield poor quality water due to improper well installation. Well 38 is a single well located 700 feet north of the landfill and was installed to monitor background water quality upgradient of the landfill. Well 40 is a single well installed at a location approximately 400 feet south of the southeast corner of the landfill and it is used to monitor downgradient water quality. Single wells 27 and 32 along with cluster wells 30, 31, 32, and 33 were installed adjacent to the landfill in areas where there were gaps in the previous monitor network.

Seven previously installed monitor wells that were in good condition and appeared to yield representative water quality samples were used for this study and are also shown in Figure 7.

Electromagnetic Survey

Two instruments were used to measure the terrain conductivity at the landfill these were the Geonics EM-31, and EM-34 non-contacting terrain conductivity meters. The Geonics EM-31 consists of a four meter long two inch diameter PVC boom housing a transmitter in one end and a receiver in the other. At the midpoint of the boom is the control box, power source, and controls. The EM-31 requires only one operator. After nulling and calibrating the EM-31, readings are taken by having the operator walk along the survey line with the instrument pointing in the direction of the line. The operator stops at the survey point to be measured, checks to verify that the boom is level and aligned with the survey line. He then selects the proper range and takes a reading from a dial on the control box. Next the EM-31 is rotated 90 degrees and a second reading is taken. Differences between readings at

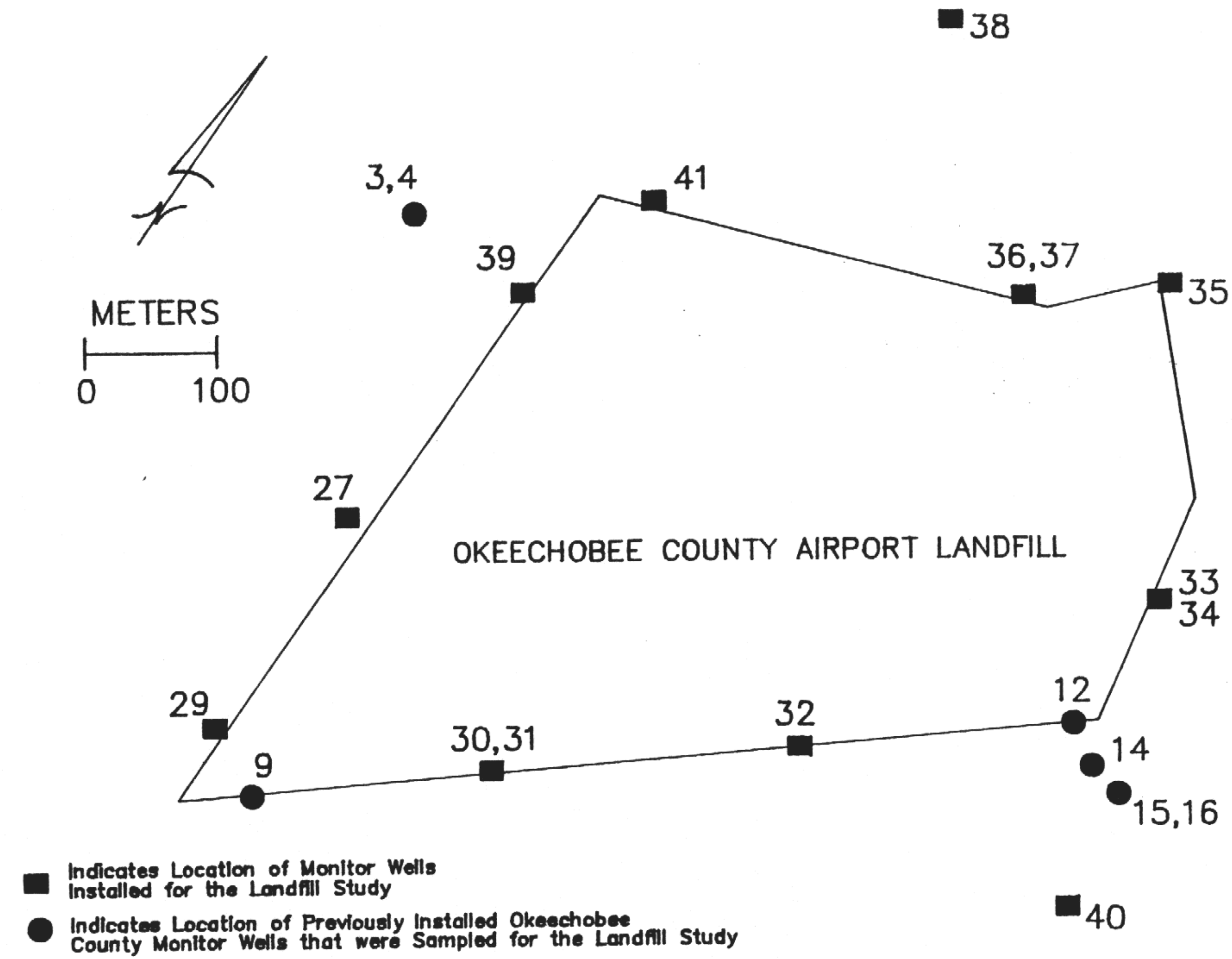


FIGURE 7 Location of Monitor Well Sites

the same station indicate buried conductors or lateral inhomogeneities in conductivity.

The Geonics EM-34 consists of one receiver and one transmitter coil (both circular in shape and 25 inches in diameter). The two coils are connected by a cable of selected length; 10, 20, or 40 meters. The receiver coil has a dial that is set to correspond with the intercoil spacing, and a meter which allows the operator to accurately set the coil spacing. The intercoil spacing affects the conductivity so it is necessary for the distance between the coils to be precisely measured. The meter allows for the distance to be adjusted to within 0.5 centimeter. The receiver coil also houses a dial that allows the operator to select any of five sensitivity range settings; 3, 10, 30, 100, or 300 millimhos/meter, and a meter that displays the conductivity. The operator selects the lowest range where the conductivity does not exceed the scale, this allows for the most precise readings.

The EM-34 requires two operators, and after nulling and calibrating the EM-34, the operators conduct the survey by walking along the survey lines separated by the intercoil spacing distance they have selected. The coils are connected by a cable of the desired length (10, 20, or 40 meters). When the survey point is located at the midpoint between the two coils, the operators align the two coils in the desired dipole position (horizontal or vertical) and make fine adjustments to the intercoil spacing using the coil separation meter. After the coils are spaced properly, the proper sensitivity range is selected and the conductivity is read off of the meter.

Prior to conducting the EM survey, an alidade and measuring tape were used to locate 215 survey points in and around the landfill. The selected survey points were marked, either by stakes or spray paint. Figure 8 shows the location of these survey points relative to the landfill. In some areas it was necessary to clear dense vegetation in order to mark the survey points and later to take the EM conductivity

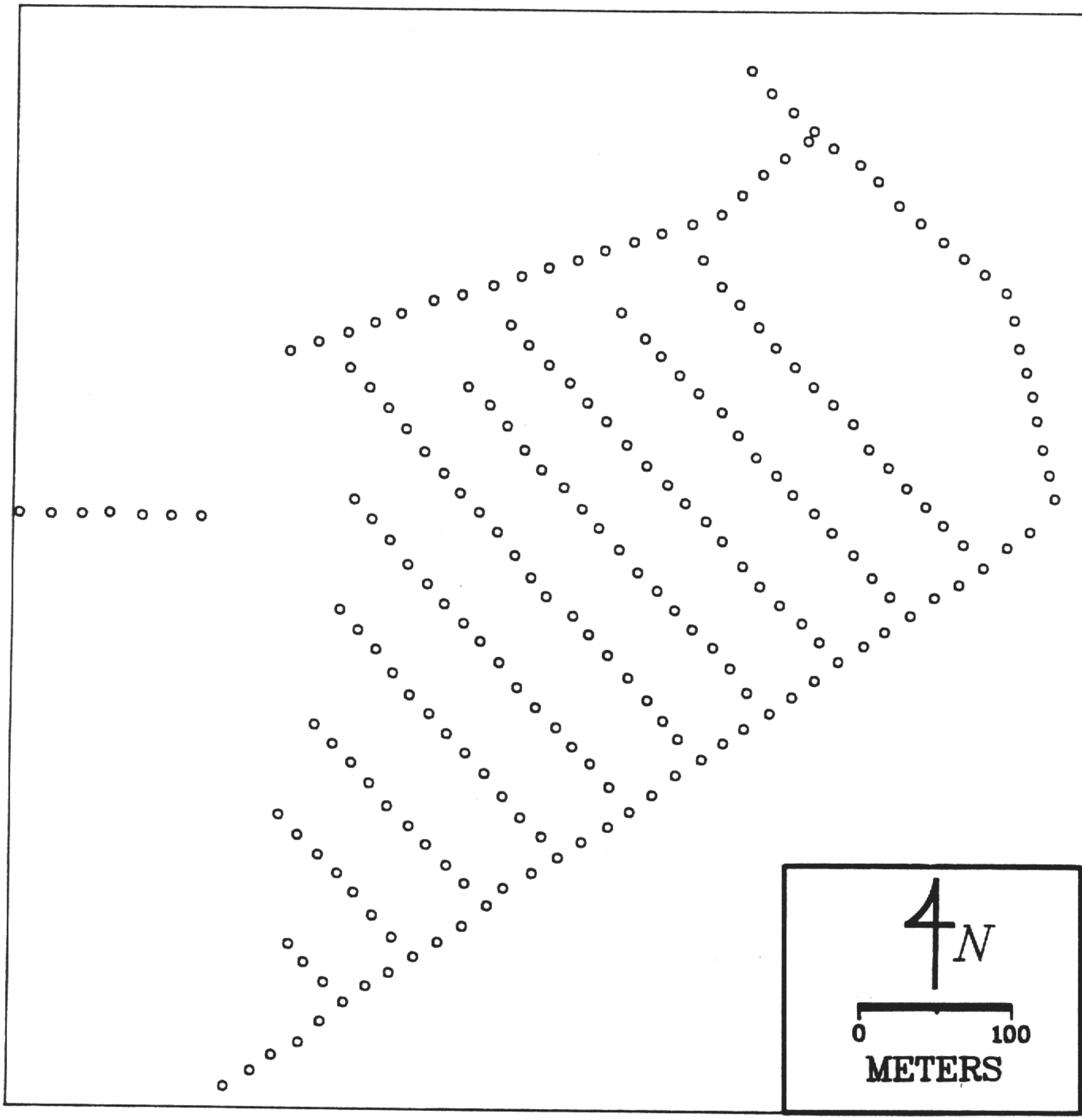


FIGURE 8 Electromagnetic Conductivity Survey Point Locations

measurements. Care was taken while selecting the survey lines to avoid powerlines, large metal fences, buildings, underground pipes and underground cables. All of these can affect the readings obtained from the EM equipment.

Water Quality Sampling

The ground water quality at the Okeechobee County Airport Landfill was determined by analyzing 37 water quality samples collected from landfill monitor wells. Additional water quality data was obtained from Geotech Inc., a private firm hired by Okeechobee County to conduct compliance monitoring required by DER.

The SFWMD collected the 37 samples from 21 separate monitor wells during three sample collection runs. These samples were analyzed for 29 inorganic water quality parameters by the SFWMD Chemistry Laboratory. The U.S. Geological Survey Q.W. Service Unit in Ocala, Florida, analyzed these samples for their Total Organic Carbon (TOC) concentrations. The University of Miami School of Medicine Department of Epidemiology Laboratory analyzed samples from the first two sample collection runs for 30 Purgeable Organic Compounds (POC). Samples from the third collection run were further analyzed by the University of Miami laboratory for the 130 organic compounds on the EPA priority pollutant list.

The 29 inorganic water quality parameters that were tested by the SFWMD Laboratory are listed below. The laboratory results for these parameters are given in Appendix IIIA.

Specific Conductivity	Total Dissolved Strontium
pH	Total Dissolved Iron
Temperature	Total Iron
Sodium	NO_3
Potassium	NO_2
Calcium	Fluoride
Magnesium	Total Arsenic
Chloride	Total Cadmium
Sulfate	Total Chromium

Alk $CaCO_3$
Ammonia
Orthophosphate
Silica
Color
Total Dissolved Solids
Total Copper
Total Mercury
Total Manganese
Total Lead
Total Zinc

The results of the TOC analyses are listed in Appendix IIIB. The samples from the first run were analyzed by the University of Miami Laboratory using a Gas Chromatograph with a Hall detector for the 30 POC's listed below.

<u>Purgeable Compound (MDL)</u>
Bromodichloromethane (1)
Bromoform (1)
Bromomethane (1)
Carbon tetrachloride (1)
Chlorobenzene(1)
Chloroethane (1)
2-Chloroethylvinyl ether (1)
Chloroform (1)
Chloromethane (1)
Dibromochloromethane (1)
Dichlorodiflouromethane (1)
1,1-Dichloroethane (1)
1,2-Dichloroethane (1)
1,1-Dichloroethene (1)
trans-1,2-Dichloroethene (1)

<u>Purgeable Compound (MDL)</u>
1,2-Dichloropropane(1)
cis-1,3-Dichloropropene (1)
trans-1,3-Dichloropropene (1)
Methylene chloride (1)
1,1,2,2-Tetrachloroethane (1)
Tetrachloroethene (1)
1,1,1-Trichloroethane (1)
1,1,2-Trichloroethane (1)
Trichloroethene (1)
Trichloroflouromethane (1)
Vinyl chloride (1)
Dichlorobenzene (1)
o-Dichlorobenzene (1)
1,2-Dibromoethane (1)
*cis-1,2-Dichloroethene

*Compound not on Priority Pollutant List
MDL = Minimum Detection Level in Parts Per Billion

Samples from the second sampling run were analyzed by the University of Miami for the 30 POC parameters and the five aromatic hydrocarbons listed on the following page:

Aromatic Hydrocarbons	Ethylbenzene
Benzene	p-Dichlorobenzene
Toluene	

This analysis also determined if any additional aromatic hydrocarbons were present. The results of the University of Miami analysis of samples from the first two runs are listed in Appendix IIIC.

Samples from the third collection run were analyzed by the University of Miami Laboratory for the 130 organic compounds on the priority pollutant list. These samples were analyzed using Gas Chromatography/Mass Spectroscopy (GC/MS) for the compounds listed below. They also analyzed for up to the 20 largest unidentified GC/MS peaks not on the following list for samples where responses were greater than 50 percent of the surrogate spike response. The results of the GC/MS analyses are given in Appendix IIID. Only the compounds that were detected are listed in the Appendix. The compounds in Appendix IIID with R's for retrofit are not on the following list, however, they were detected and there is an 85 percent or better probability they were present in the sample.

PURGEABLES

Parameter	MDL	Parameter	MDL
1. Acrolein	25	14. Dichlorodifluoromethane	5
2. Acrylonitrile	25	15. 1,1-Dichloroethane	5
3. Benzene	5	16. 1,2-Dichloroethane	5
4. Bromodichloromethane	5	17. 1,1-Dichloroethane	5
5. Bromoform	5	18. 1,2-Dichloroethane	5
6. Bromomethane	5	19. 1,2-Dichloropropane	5
7. Carbon tetrachloride	5	20. cis-1,3-Dichloropropene	5
8. Chlorobenzene	5	21. trans-1,3-Dichloropropene	5
9. Chloroethane	5	22. Ethylbenzene	5
10. 2-Chloroethylvinyl ether	5	23. Methylene chloride	5
11. Chloroform	5	24. 1,1,2,2-Tetrachloroethane	5
12. Chloromethane	5	25. Tetrachloroethene	5
13. Dibromochloromethane	5	26. 1,1,1-Trichloroethane	5

PURGEABLES (continued)

	Parameter	MDL		Parameter	MDL
27.	1,1,2-Trichloroethane	5	34.	Dichlorobenzene	5
28.	Trichloroethene	5	35.	o-Chlorobenzene	5
29.	Trichlorofluoromethane	5	36.	n-Propylbenzene	5
30.	Toluene	5	37.	n-Butylbenzene	5
31.	Vinyl chloride	5	38.	Trimethylbenzene	5
32.	Xylene	5	39.	1,2-Dibromoethane	5
33.	Styrene	5			

ACID EXTRACTABLES

	Parameters	MDL		Parameters	MDL
1.	4-Chloro-3-methyl penol	10	7.	2-Nitrophenol	10
2.	2-Chlorophenol	15	8.	4-Nitrophenol	20
3.	2,4-Dichlorophenol	10	9.	Pentachlorophenol	30
4.	2,4-Dimethylphenol	5	10.	Phenol	5
5.	2,4-Dinitrophenol	30	11.	2,4,6-Trichlorophenol	20
6.	2-Methyl-4,6-Dinitrophenol	20			

BASE NEUTRAL EXTRACTABLES

	Parameters	MDL		Parameters	MDL
1.	Acenaphthene	10	17.	4-Chlorophenyl phenyl ether	10
2.	Acenaphthylene	10	18.	Chrysene	10
3.	Anthracene	10	19.	Dibenzo(a,h)anthracene	25
4.	Benzo(a)anthracene	10	20.	Di-n-butylphthalate	10
5.	Benzo(b)fluoranthene	10	21.	1,3-Dichlorobenzene	10
6.	Benzo(k)fluoranthene	10	22.	1,4-Dichlorobenzene	10
7.	Benzo(a)pyrene	10	23.	1,2-Dichlorobenzene	10
8.	Benzo(g,h,i)perylene		24.	3,3-Dichlorobenzidine	10
9.	Benzidine	10	25.	Diethylphthalate	10
10.	Bis(2-chloroethyl)ether	10	26.	Dimethylphthalate	10
11.	Bis(2-chloroethoxy)methane	10	27.	2,4-Dinitrotoluene	10
12.	Bis(2-ethylhexyl)phthalate	10	28.	2,6-Dinitrotoluene	10
13.	Bis(2-chloroisopropyl)ether	10	29.	Dioctylphthalate	10
14.	4-Bromophenyl phenyl ether	10	30.	1,2-Diphenylhydrazine	10
15.	Butyl benzyl phthalate	10	31.	Fluoranthene	10
16.	2-Chloronaphthalene	10	32.	Fluorene	10

33. Hexachlorobenzene	10	41. N-Nitrosodimethylamine	
34. Hexachlorobutadiene	10	42. N-Nitrosodi-n-proplamine	10
35. Hexachloroethane	10	43. N-Nitrosodiphenylamine	10
36. Hexachlorocyclopentadiene	10	44. Phenanthrene	10
37. Indeno (1,2,3,-cd)pyrene		45. Pyrene	10
38. Isophorone	10	46. 2,3,7,8-Tetrachlorodibenzo-p-dioxin	
39. Naphthalene	10	47. 1,2,4-Trichlorobenzene	10
40. Nitrobenzene	10		

PESTICIDE EXTRACTABLES

Parameters	MDL	Parameters	MDL
1. Aldrin	.01	18. Toxaphene	.25
2. a-BHC	.01	19. PCB-1016	.25
3. b-BHC	.01	20. PCB-1221	.25
4. g-BHC	.01	21. PCB-1232	.25
5. d-BHC	.01	22. PCB-1242	.25
6. Chlordane	.25	23. PCB-1248	.25
7. 4,4'-DDD	.03	24. PCB-1254	.5
8. 4,4'-DDE	.03	25. PCB-1260	.5
9. 4,4-DDT	.03	26. 2,4-D	.2
10 Dieldrin	.03	27. 2,4,5-TP	.05
11. Endosulfan I	.03	28. Demeton	
12. Endosulfan II	.03	29. Guthion	2.0
13. Endosulfan Sulfate	.03	30. Malathion	.2
14. Endrin	.03	31. Methoxychlor	.06
15. Endrin Aldehyde		32. Mirex	.03
16. Heptachlor	.01	33. Parathion	.07
17. Heptachlor Epoxide	.01		

MDL = Minimum Detection Level in Parts Per Billion

The ground water quality at the Okeechobee County Airport landfill has been monitored in the past by Geotech Inc. Geotech tested for the following parameters:

Specific Conductivity	Chemical Oxygen Demand
pH	Lead

NO_3 - Nitrogen (NO_2 and NO_3)	Copper
Iron	Fecal Coliform
Chlorides	Temperature

The results from seven monitor wells that were sampled by Geotech Inc. on two occasions are listed in Appendix IIIE. The Geotech well numbers coincide with the SFWMD well numbers, however, the SFWMD numbers are preceded by the OKLF prefix. Results from some of the wells that Geotech sampled are not presented in this report. Either the well depth was not known or it was felt that the sample from the well was not representative of the water quality in the aquifer.

GEOLOGY

Figure 9 shows the geologic formations in the study area. The stratigraphic sequence described in this report ranges in age from Pleistocene to Holocene. The Pleistocene series is composed of the Caloosahatchee Marl and the Pamlico Sand. The Holocene series is composed of undifferentiated fine sands which have been divided into three different soil types, the Immokalee, Myakka, and Basinger fine sands.

Pleistocene Series

Caloosahatchee Marl

The Caloosahatchee Marl of early Pleistocene origin is composed of shells, sand, and silt of Marine origin. According to Parker and others, (1955) it attains a thickness of up to 50 feet in some areas around Lake Okeechobee. The deepest borings at the landfill site were to a depth of 50 feet below land surface. At this depth one boring had penetrated 38 feet of the Caloosahatchee marl without reaching the base of the marl.

The top of the Caloosahatchee marl at the landfill site is marked by a two to five foot thick sandy shell bed shown in Figures 10 and 11. (Figure 7 shows the locations of the wells used to construct these cross sections.) This sandy shell bed is well indurated along the western boundary of the landfill, and is moderately to poorly indurated elsewhere. Chione cancellata was abundant in the cuttings from this bed. During the landfills operation the deeper trenches were excavated to the top of this bed. Below this upper shell bed there are alternating beds of shelly sands and sandy shell beds, to a depth of 50 feet, the greatest depth from which information was obtained in the landfill area.

The Caloosahatchee Marl has low permeability and generally poor water quality (Parker and others, 1955). However, some of the two inch monitor wells with 5 feet of screen produced over 30 gallons per minute without significant drawdown. The

SERIES	FORMATION	THICKNESS FEET		LITHOLOGY
Holocene	Undifferentiated	5–7	Fine Sand	Fine quartz sand. Dark brown to light gray with some silt and clay. Unconsolidated.
Pleistocene	Pamlico Sand	5–10	Fine Sand	Medium to fine quartz sand. Brownish–red to light–gray. to high sphericity, rounded grains. Unconsolidated.
	Caloosahatchee Marl	40–50	Sandy Shell Bed	Predominantly shells and shell fragments, approx. 25% sand and silt. White to light gray. Chione Cancellata abundant. Good to poor induration.
			Shelly Sand	Predominantly sand, with some shells and silt. Light gray to light orange. Poor induration.

FIGURE 9 Geologic Formations in the Study Area

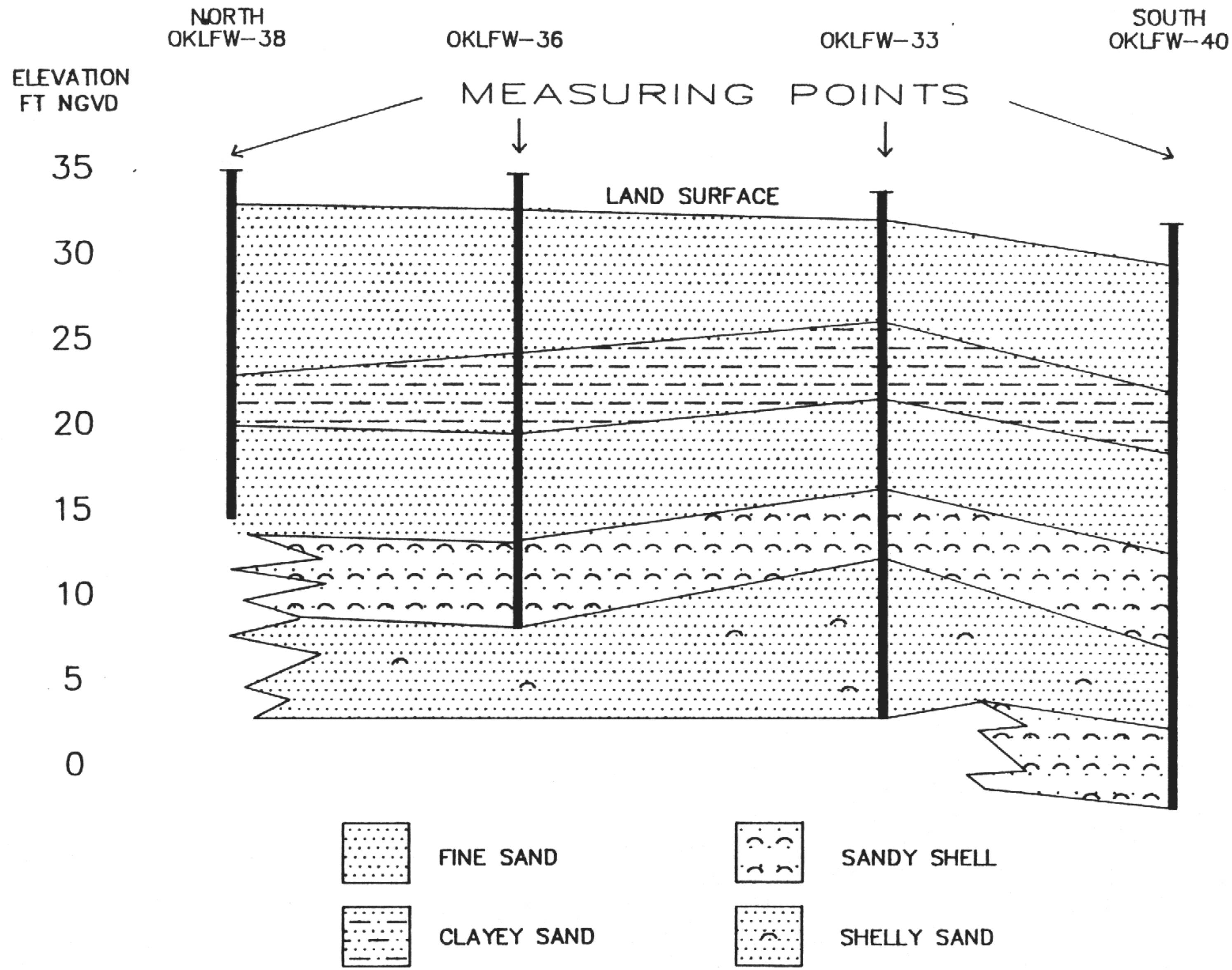


FIGURE 10 North-South Geologic Cross-Section

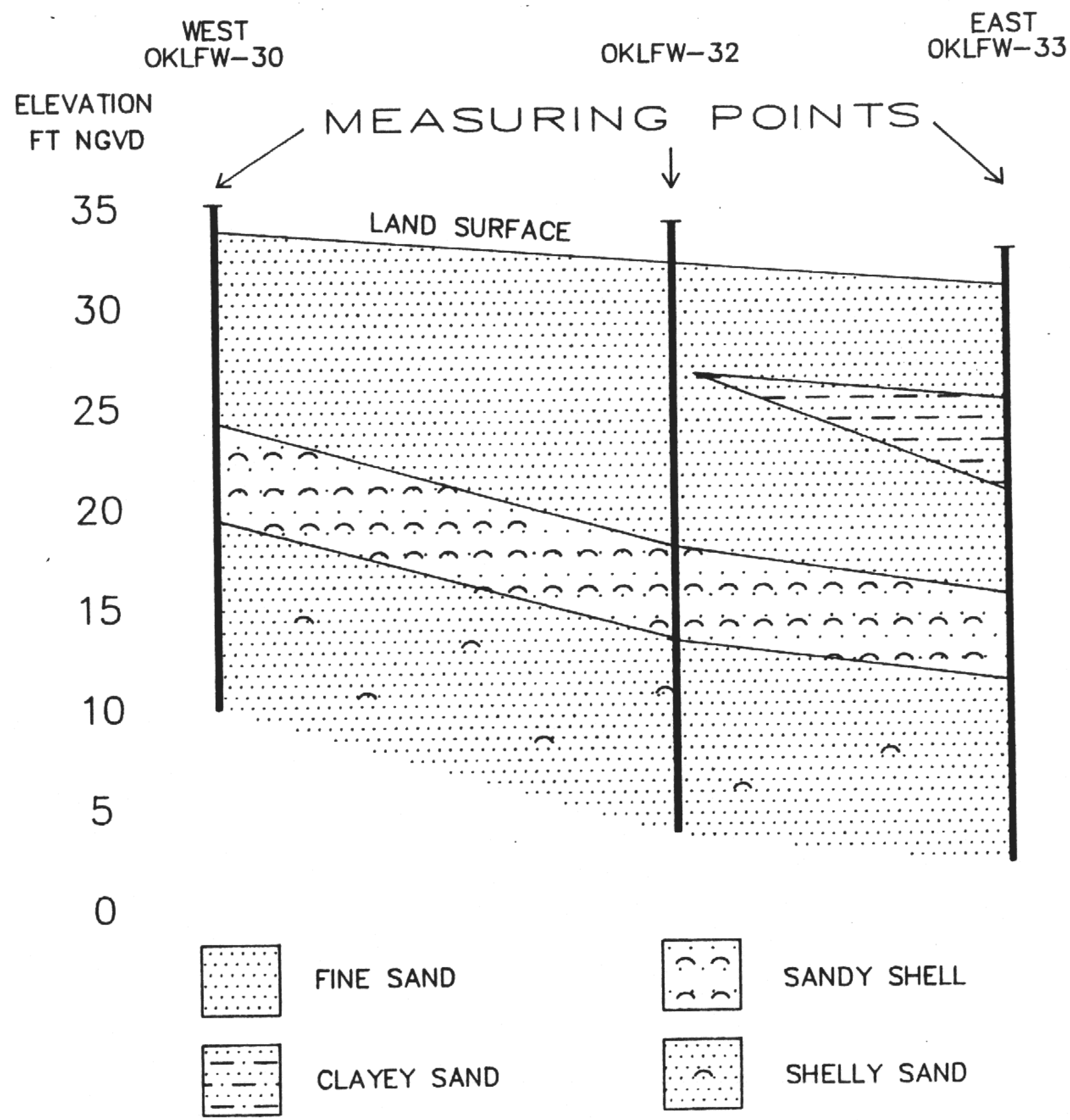


FIGURE 11 **East-West Geologic Cross-Section**

Okeechobee County Airport and the County Humane Society have both used production wells that were screened at a depth of 70 feet below land-surface, near the base of the Caloosahatchee marl. Private residential wells in the area probably also draw water from the base of the Caloosahatchee marl.

Pamlico Sand

The Pamlico Sand is composed of medium to fine grained unconsolidated quartz sand that is brownish-red to light-gray in color. Its thickness is reported (McCollum and Pendelton, 1971) to vary from less than one foot to about ten feet. In the vicinity of the landfill its average thickness was five to ten feet. The Pamlico sand yields small quantities of water to the monitor wells, but they must be purged slowly.

Holocene Series

The Holocene Series at the landfill is comprised of fine sand that has been categorized into three different soils by the USDA Soil Conservation Service. These three soils are the Immokalee fine sand, the Myakka fine sand and the Basinger fine sand, ponded. The Immokalee fine sand occupied the eastern two-thirds of the landfill except for two slight depressions approximately 100 meters in diameter that were comprised of Basinger fine sand. The western third of the landfill is composed of the Myakka fine sand.

The Immokalee fine sand is a deep poorly drained, nearly level sandy soil which is common in broad flatwood areas in Okeechobee County. The soil survey of Okeechobee County describes a typical profile as follows:

> "In a typical profile the surface layer is very strongly acid, very dark gray fine sand about 6 inches thick. The subsurface layer is light-gray to white fine sand about 29 inches thick. An organic pan layer, about 20 inches thick, is at a depth of about 35 inches. The upper part of this pan is weakly cemented, black fine sand, and the lower part is mottled

dark reddish-brown fine sand. Below is strongly acid, brown fine sand. The water table normally is at a depth of about 30 inches."

The Myakka fine sand is very similar to the Immokalee fine sand, and like the Myakka fine sand it is a deep, poorly drained, nearly level, sandy soil found in broad flatwood areas of Okeechobee County. The soil survey describes the Myakka fine sand as follows:

> "In a typical profile the surface layer is very strongly acid, dark-gray fine sand about 6 inches thick. The subsurface layer is light-gray fine sand about 18 inches thick. At a depth of about 24 inches is a well-developed organic pan. This pan is very strongly acid, weakly cemented, dark reddish-brown fine sand about 6 inches thick. Just below is a layer of dark-brown fine sand about 10 inches thick. The underlying material consists of layers of pale-brown and light brownish-gray fine sand that extend to a depth of more than 66 inches. The water table normally is at a depth of about 30 inches."

The Basinger fine sand, ponded occurred in two roughly circular depressions of about 100 meters in diameter. One of these depressions occurred at the center of the landfill, and the other near the central northeastern portion of the landfill. The soil survey described the Basinger fine sand as follows:

> "In a typical profile the surface layer is strongly acid, very dark gray fine sand about 2 inches thick. The subsurface layer is light-gray fine sand about 16 inches thick. The next layer is light brownish-gray and brown fine sand that contains darker brown, weakly cemented fragments. Below is light-colored sand. The water table normally is at a depth of about 20 inches."

The Basinger fine sand, ponded lacks the well-developed organic pan that is typical of Immokalee and Myakka soils. The clayey sand layer shown on Figures 10 and 11 corresponds with the organic pan layer mentioned in the soil survey descriptions for the Immokalee and Myakka fine sands. The clayey sand layer at the landfill is both thicker and deeper than the pan mentioned in the soil survey. This is also true for the sand above the clayey sand layer. The surface soils appear to be twice as thick as the typical profiles described by the soil survey.

All of the fine sands at the surface have moderate permeabilities. The clayey sand layer has a reduced permeability but the permeability is not low enough for this layer to serve as an aquaclude.

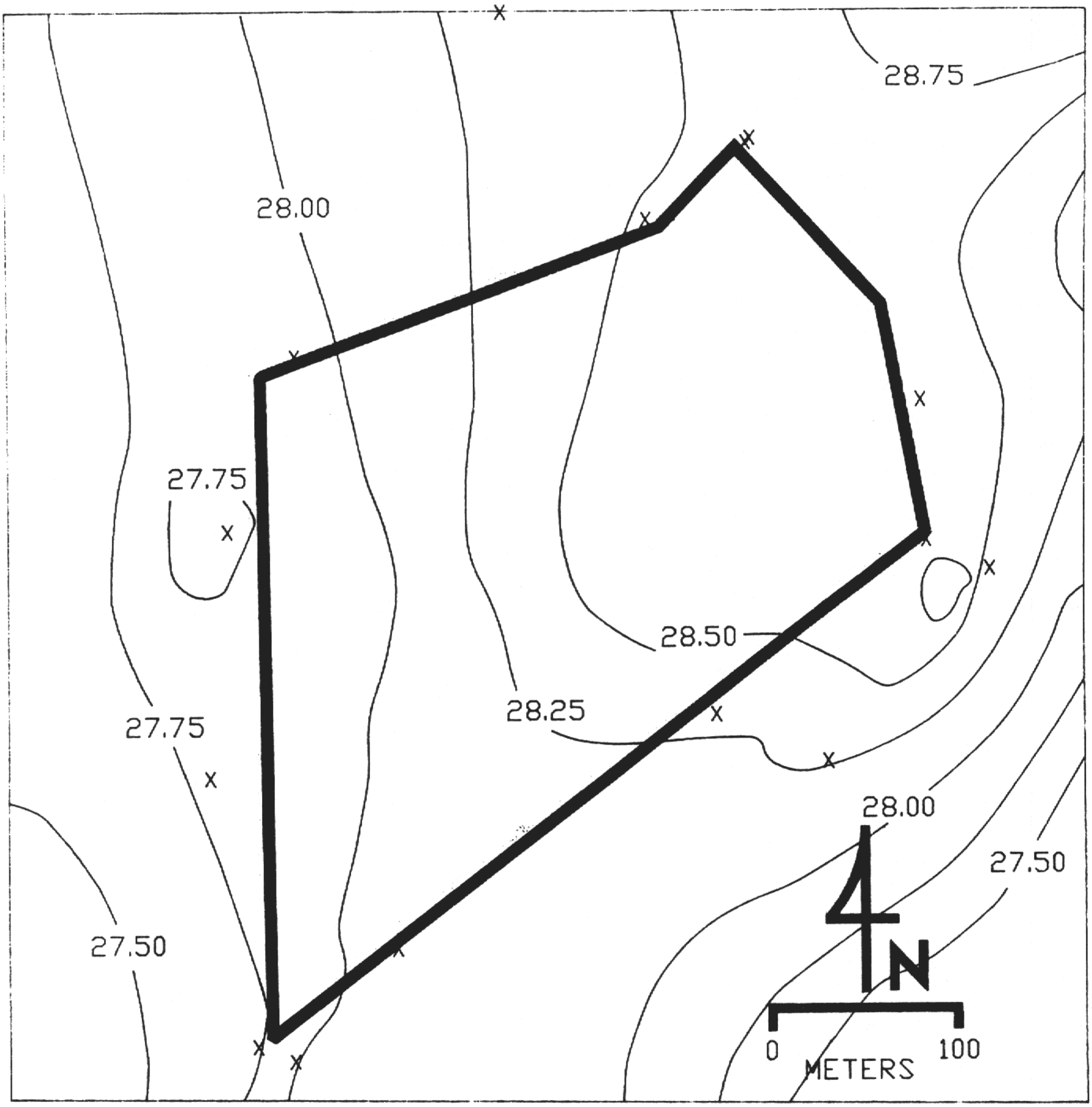
HYDROLOGY

Ground Water Flow

Figures 12 through 14 show the water level contours at the Okeechobee County Airport Landfill. These maps were generated from water level measurements collected during February, April, and July 1985. The locations of the water level measurement points on the maps are indicated by the symbol x. The maps show the water table to be highest beneath the eastern portion of the landfill and the ground water flow to be toward the west-southwest from the western portion of the landfill. Ground water flow in the eastern portion of the landfill is toward the southeast. Figure 12 was generated from water table elevations collected on February 25, 1985, near the end of the dry season (Figure 2). This figure shows the water to be moving toward the landfill from the northeast, and flowing away from the landfill to the southwest and southeast.

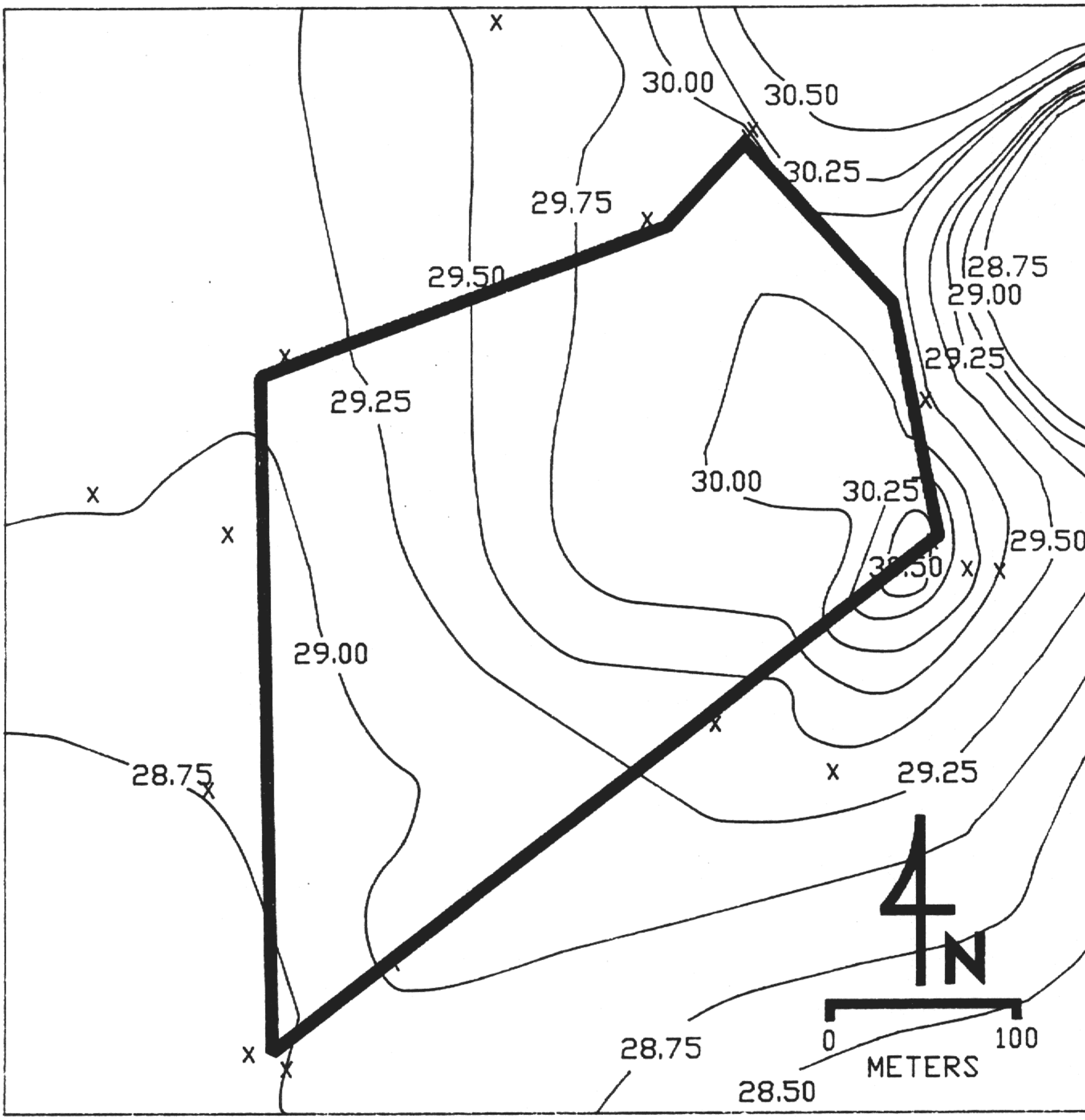
Figure 13 shows the elevation of the water table surface generated from data collected on April 17, 1985. This map shows the same trend as Figure 12, water flowing toward the landfill from the northeast, and then flowing away from the landfill toward the southwest and southeast.

Figure 14 shows the elevation of the water table generated from data collected on July 29, 1985, during the middle of the rainy season (Figure 2) and one day after a major rainfall event that generated five inches of rain in 48 hours. This map shows the water table to be mounded over the landfill, with ground water flowing away from the landfill in all directions except toward the northeast. The water table is mounded over the landfill because the elevation of the eastern portion of the landfill is approximately five feet higher than the surrounding land.



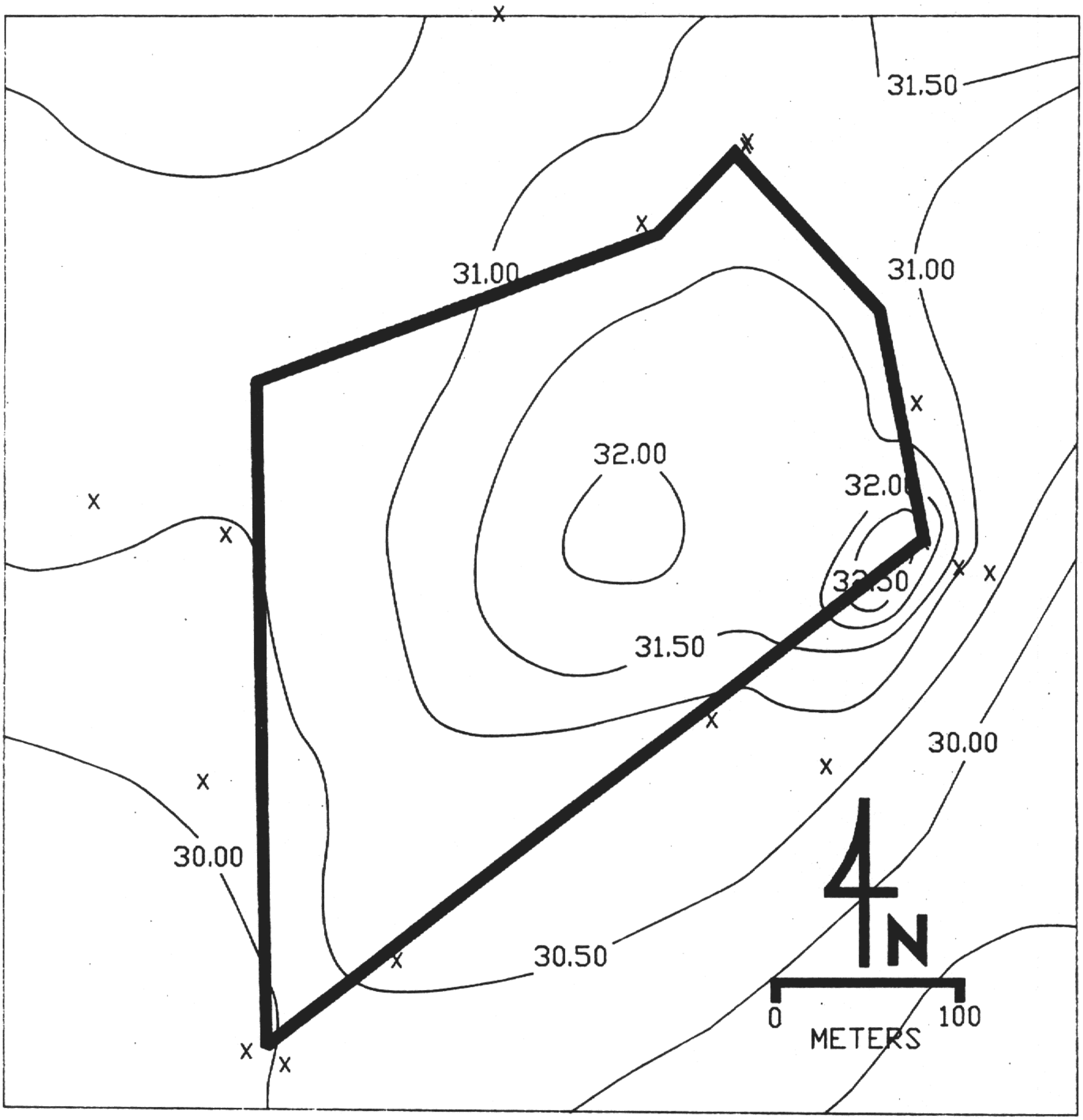
CONTOUR INTERVAL .25 FEET NGVD

FIGURE 12 Water Levels, February, 1985



CONTOUR INTERVAL = .25 FEET NGVD

FIGURE 13 Water Levels, April, 1985



CONTOUR INTERVAL .50 FEET NGVD

FIGURE 14 Water Levels, July, 1985

ELECTROMAGNETIC SURVEY

Electromagnetic Theory

Measurement of ground resistivity has long been used as a geophysical technique to differentiate changes in lithology and water quality. Resistivity values themselves are not usually diagnostic, but their variation in a study area can be used to show trends in lithology and water quality. Recently resistivity surveys have been used to help locate leachate plumes. The lateral variation of the resistivity values can be plotted and contoured to generate a map showing areas of higher conductivity (the reciprocal of resistivity).

Most soil and rock minerals are electrical insulators of very high resistivity, unless certain conductive minerals are present in sufficient quantities to greatly increase the overall conductivity. None of these conductive minerals are found in large quantities in southern Florida. In areas where the soil and rock minerals act as insulators, the conductivity is electrolytic and takes place through the moisture-filled pores and passages contained within the insulating matrix. This conductivity is controlled by five factors.

1. Porosity; shape and size of pores, number, size and shape of interconnecting passages.
2. The depth to the water table.
3. Concentration of dissolved electrolytes in the ground water, i.e. water quality.
4. Temperature and phase state of porewater.
5. Amount and composition of colloids.

Test borings and cuttings from monitor wells drilled at the landfill indicate that the porosity at the landfill did vary laterally, as did the amount and composition of colloids. These variations were not significant enough to have a noticeable affect on the EM readings.

Water level measurements from monitor wells in the test area show that the elevation of the water table fluctuates approximately 3 to 4 feet between the dry season and the wet season. However, the water table follows the topography and the depth to water, below land surface, does not differ by more than two feet throughout the landfill. During the wet season, the water table is within 3 feet of land surface; in the dry season, it falls to approximately 5 to 7 feet below land surface. Water temperature in the monitor wells varied from a high of 24.2°C to a low of 20.0°C.

None of the above factors varied enough to cause significant changes in the EM values obtained during the survey. Water quality was the only factor to show significant variations, therefore, the changes in EM values reflect changes in water quality.

Electromagnetic Survey Results

Figures 15 and 16 show the conductivity contours generated by the Geonics EM-31 conductivity meter for an effective depth of penetration of approximately 5.5 meters. Both maps show two areas of higher conductivity in the west-central portion of the landfill. A broad plume of increased conductivity extends out to the south and it is more elongated toward the southwest and southeast.

Figure 17 shows the conductivity contours generated by the Geonics EM-34 conductivity meter with the coils held in the horizontal dipole mode and with an intercoil spacing of 10 meters. This configuration gave an effective depth of penetration of approximately 7.5 meters. This map is very similar to the EM-31 conductivity maps (Figures 15 and 16). There are two areas of high conductivity in the west-central portion of the landfill. The plume that was apparent on the EM-31 conductivity distribution maps had the same general outline. The conductivity distribution for this survey has a single area of higher conductivity located at the center of the western boundary further west than the areas of highest conductivity from the shallower surveys. There is a plume emanating from this high that extends

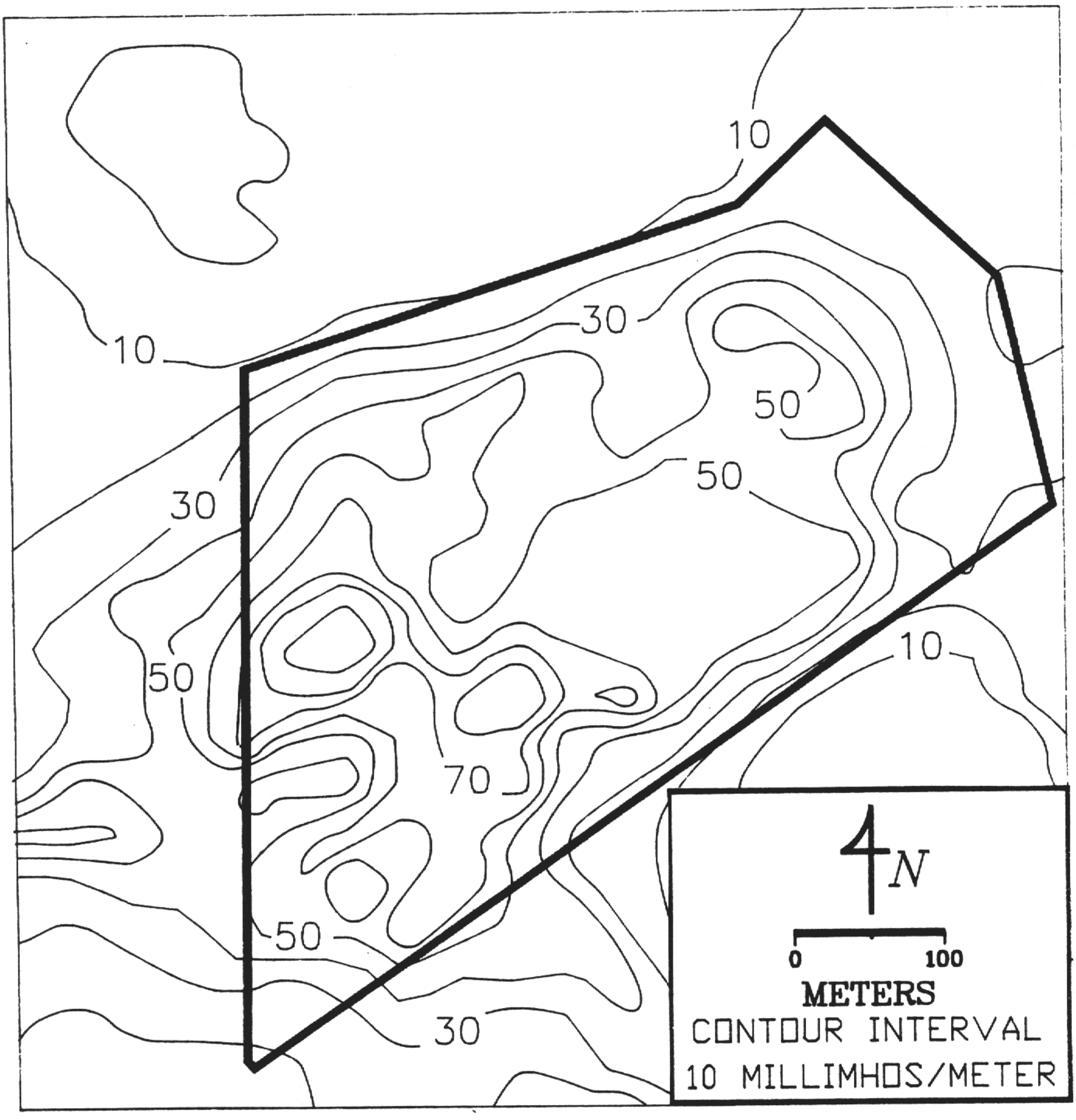


FIGURE 15 EM-31 East-West Conductivity Survey, January, 1985

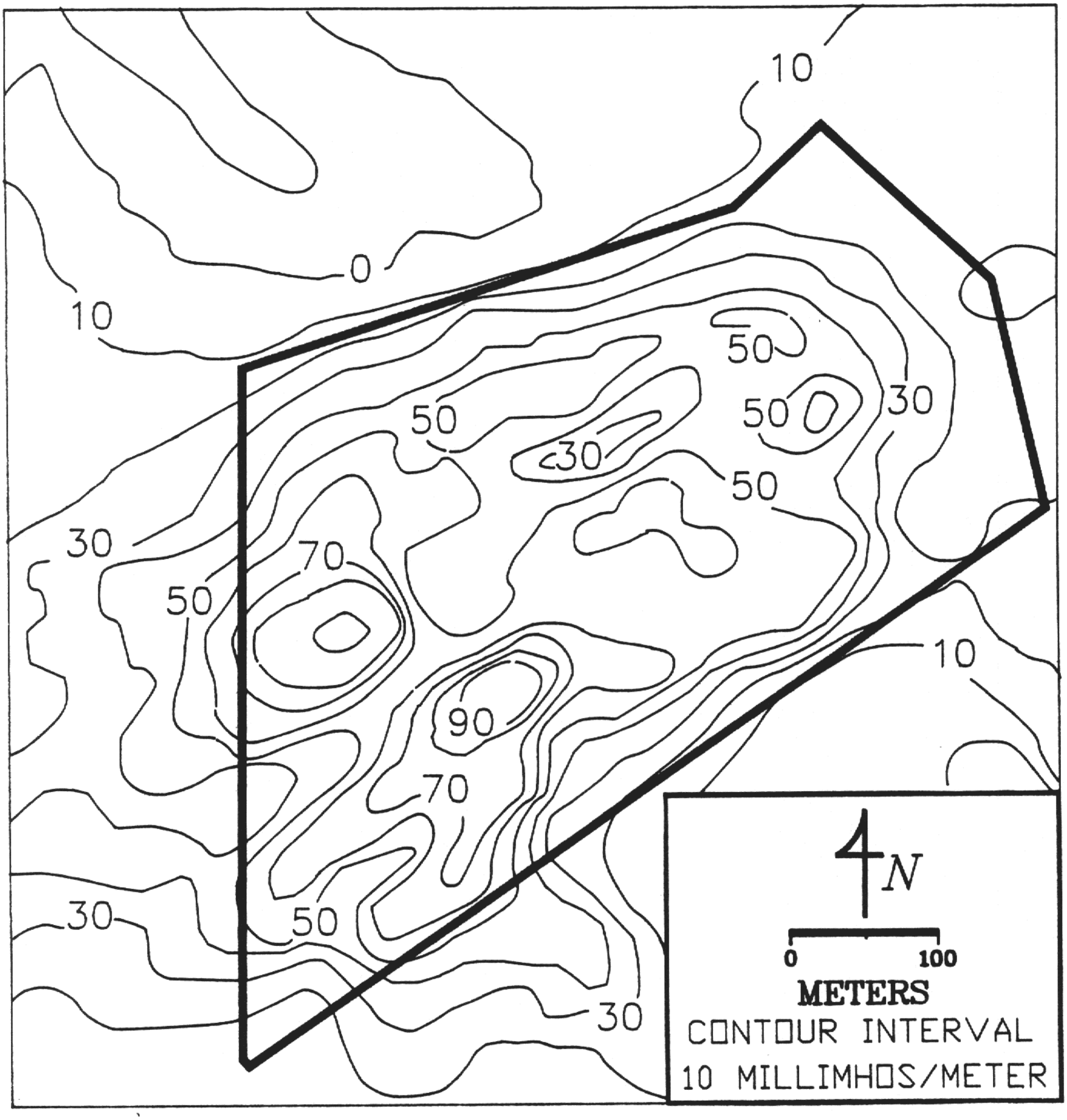


FIGURE 16 EM-31 North-South Conductivity Survey, January, 1985

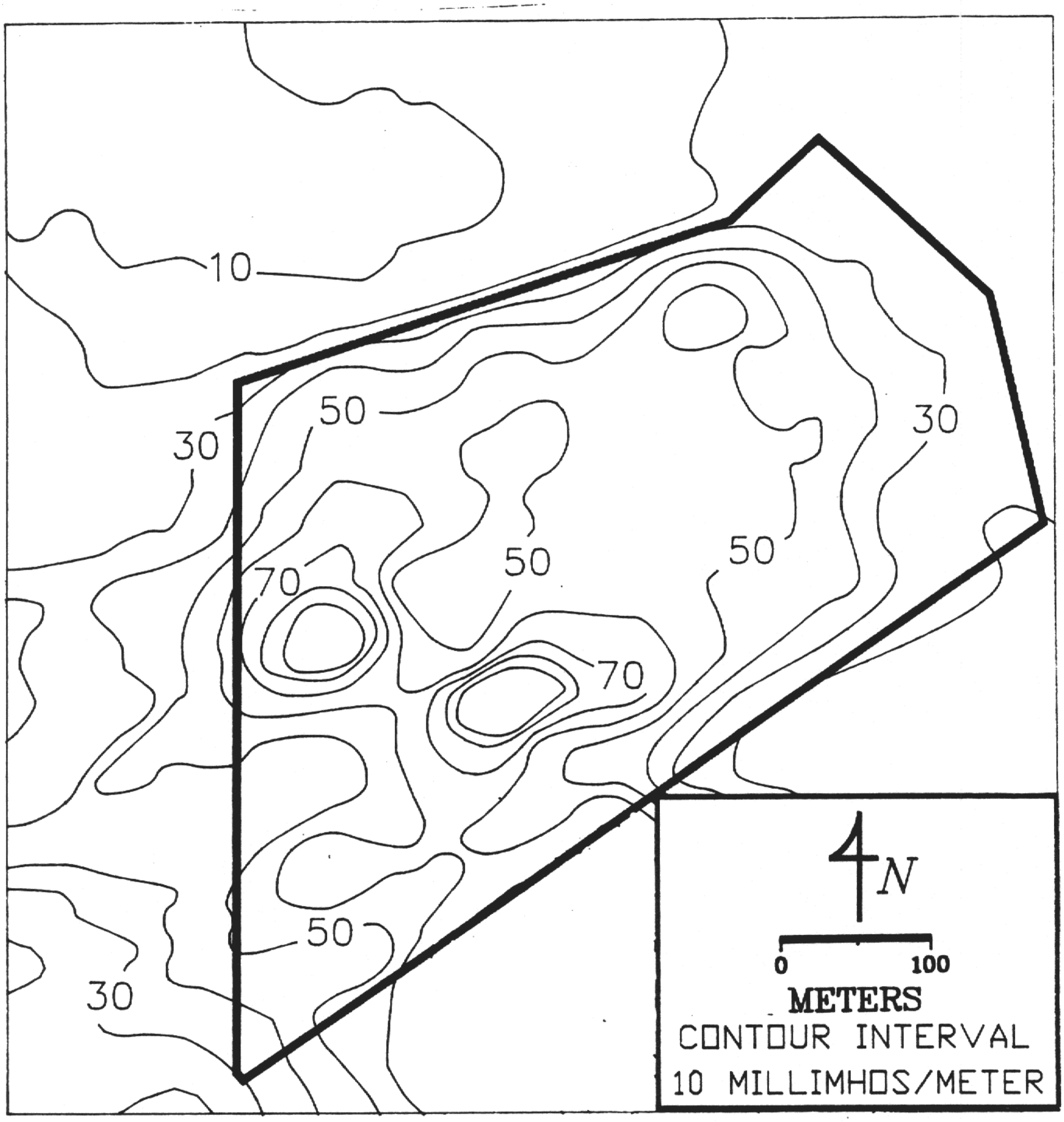


FIGURE 17 EM-34 Horizontal Conductivity Survey, January, 1985

out to the southwest. Water table maps show the direction of ground water flow in this area of the landfill to be toward the southwest. The southwestward direction of water flow coupled with the fact that the deeper survey had the high area of conductivity shifted southwestward from the location of the high area of conductivity for the shallow survey indicates that the source of this increased conductivity is located within 5.5 meters of land surface (effective depth of penetration for the shallow survey).

Figure 18 shows the conductivity distribution generated from the Geonics EM-34 conductivity meter, with the coils held in the vertical dipole mode and with a coil spacing of 10 meters. This configuration gave an effective depth of penetration of 15 meters, twice the depth of the other surveys.

The similarity of the conductivity contours generated by the EM-31 and the EM-34 conductivity meters confirms the accuracy of both meters. The highest conductivity values for all of the surveys were in the west-central portion of the landfill, indicating that this area has the poorest water quality. There is a plume of increased conductivity emanating from the western and southwestern area of the landfill and extending out to the south, the primary direction of water flow at this area of the landfill.

The EM-34 vertical conductivity survey (effective depth of penetration of 15 meters) showed the same general features as the other surveys with the shallower effective depths of penetration. These features were shifted to the southwest on the deeper survey indicating that leachate is moving down vertically and to the southwest. A typical pattern of leachate migration from a landfill is shown in Figure 19. The conductivity values were higher for the shallow surveys, indicating that the water quality near the surface, to a depth of 7.5 meters, is worse than the water quality from 7.5 meters to 15 meters. This is supported by the fact that the

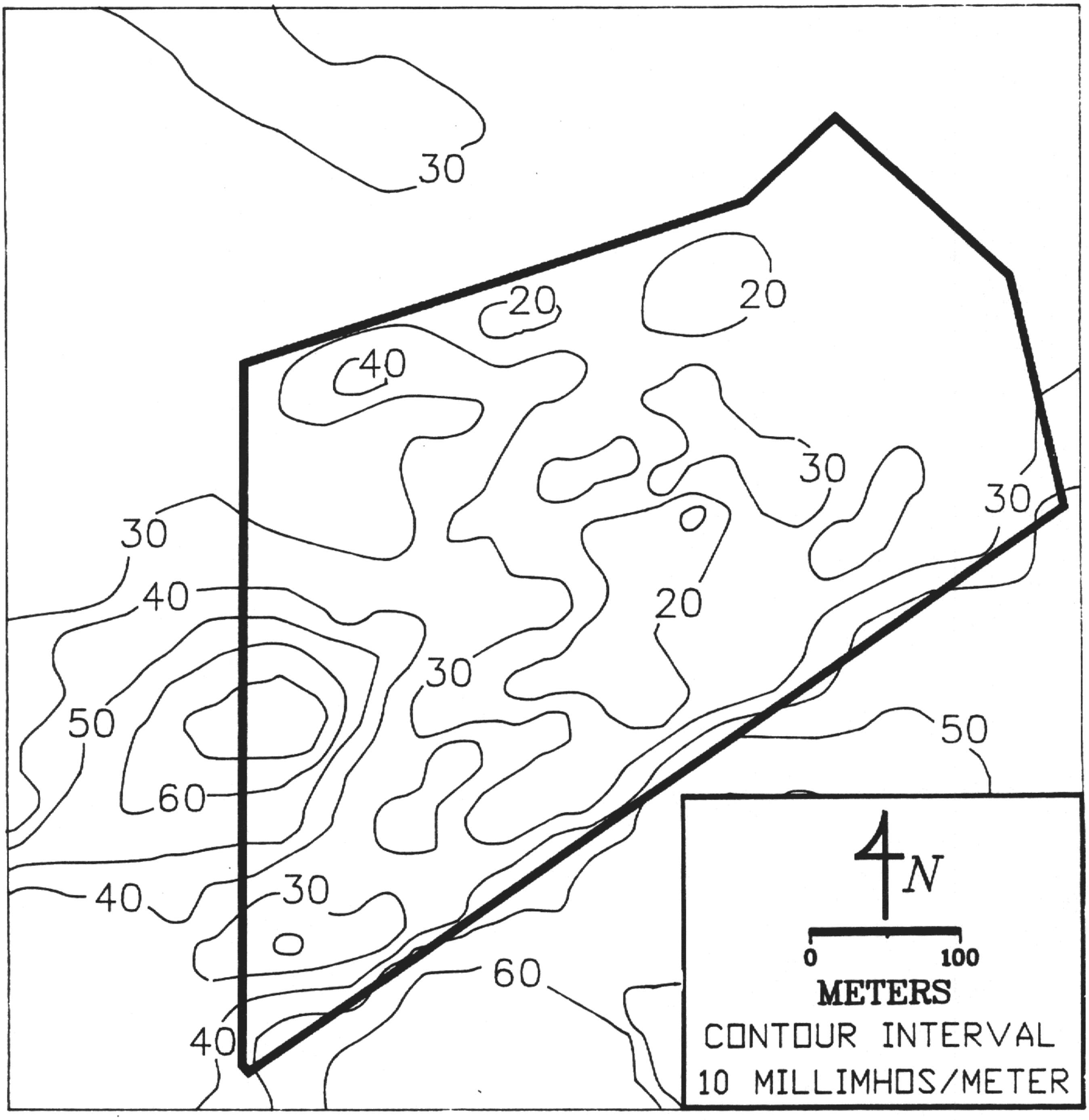


FIGURE 18 EM-34 Vertical Conductivity Survey, January, 1985

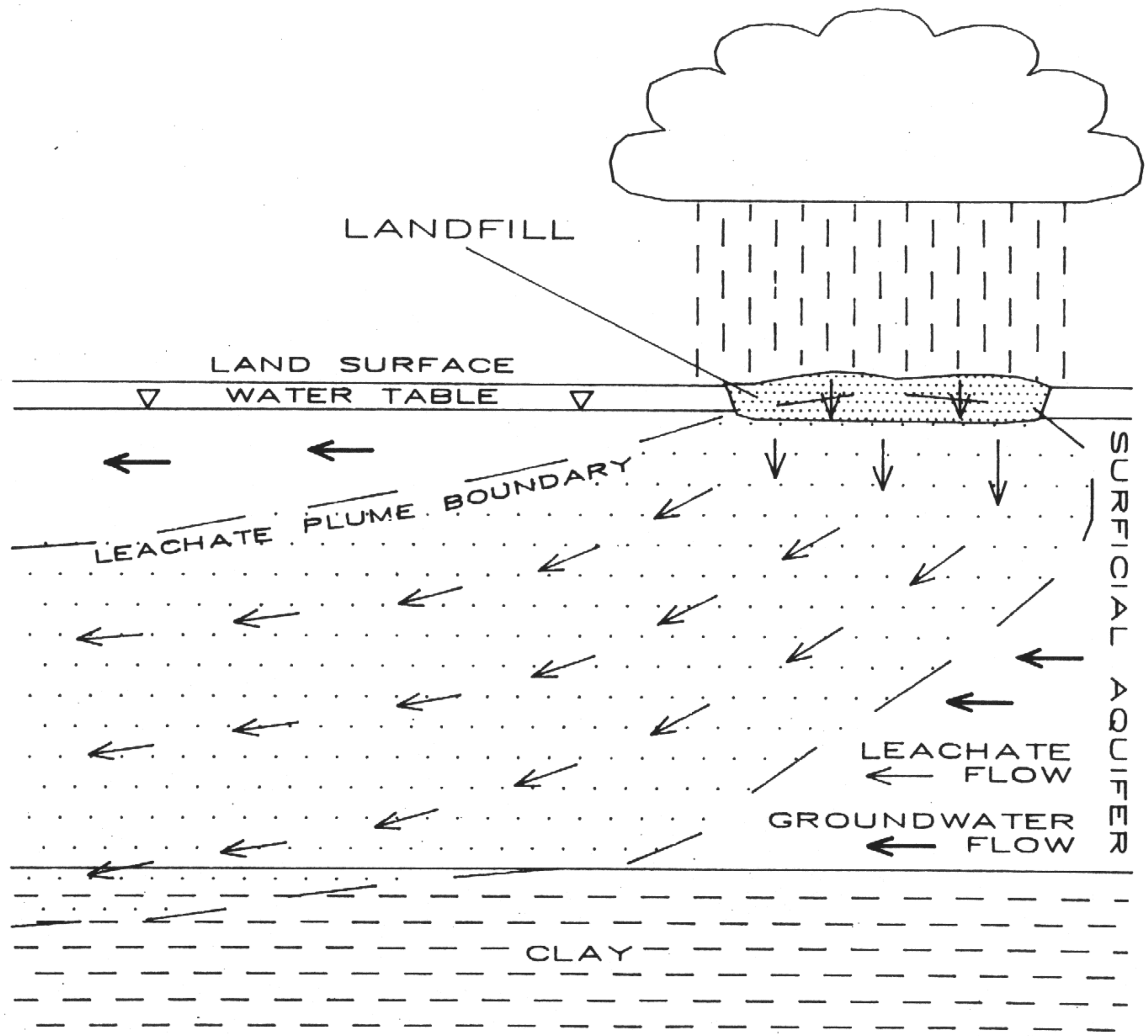


FIGURE 19 Generalized Cross-Section Showing Leachate Migration from a Landfill

conductivity of the shallower wells at the cluster well sites was significantly higher than the conductivity of the corresponding deeper well for samples collected.

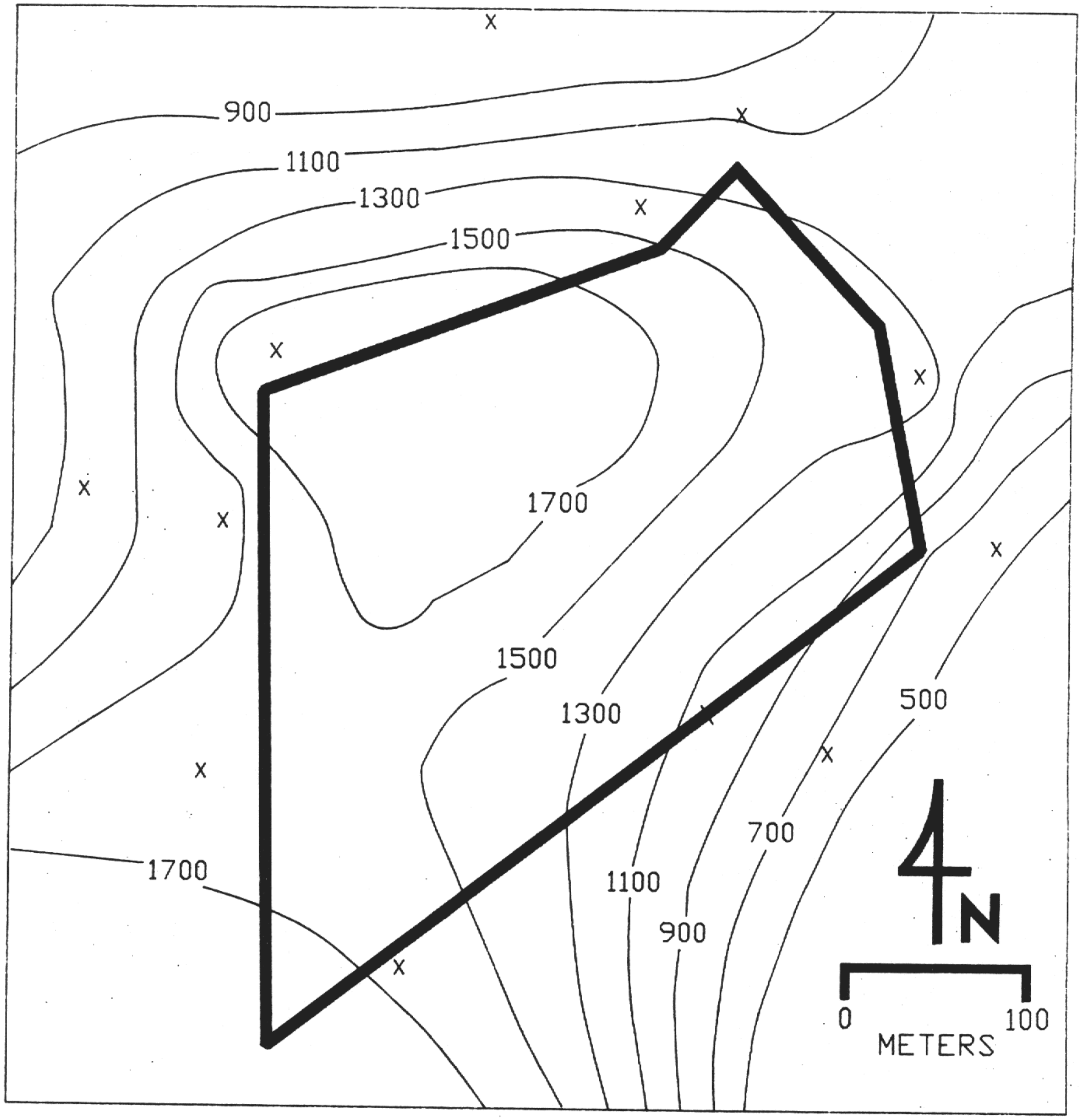
WATER QUALITY SAMPLING RESULTS

Contour maps generated for conductivity, total dissolved solids (TDS), chlorides, and manganese (Figures 20, 21, 22, and 23) all show similar trends. Concentrations are higher beneath and downgradient (southwest) of the landfill than they are in the surrounding areas. The worst water quality appears to be located in the west, northwestern corner of the landfill where sludges were buried.

Although the water quality beneath and downgradient of the landfill is degraded from background water quality, the degraded water quality exceeded the primary drinking water standards (see Appendix IV) for only two parameters, chromium and benzene. Three parameters TDS, iron, and manganese had concentrations in some monitor wells that exceeded the secondary drinking water standards.

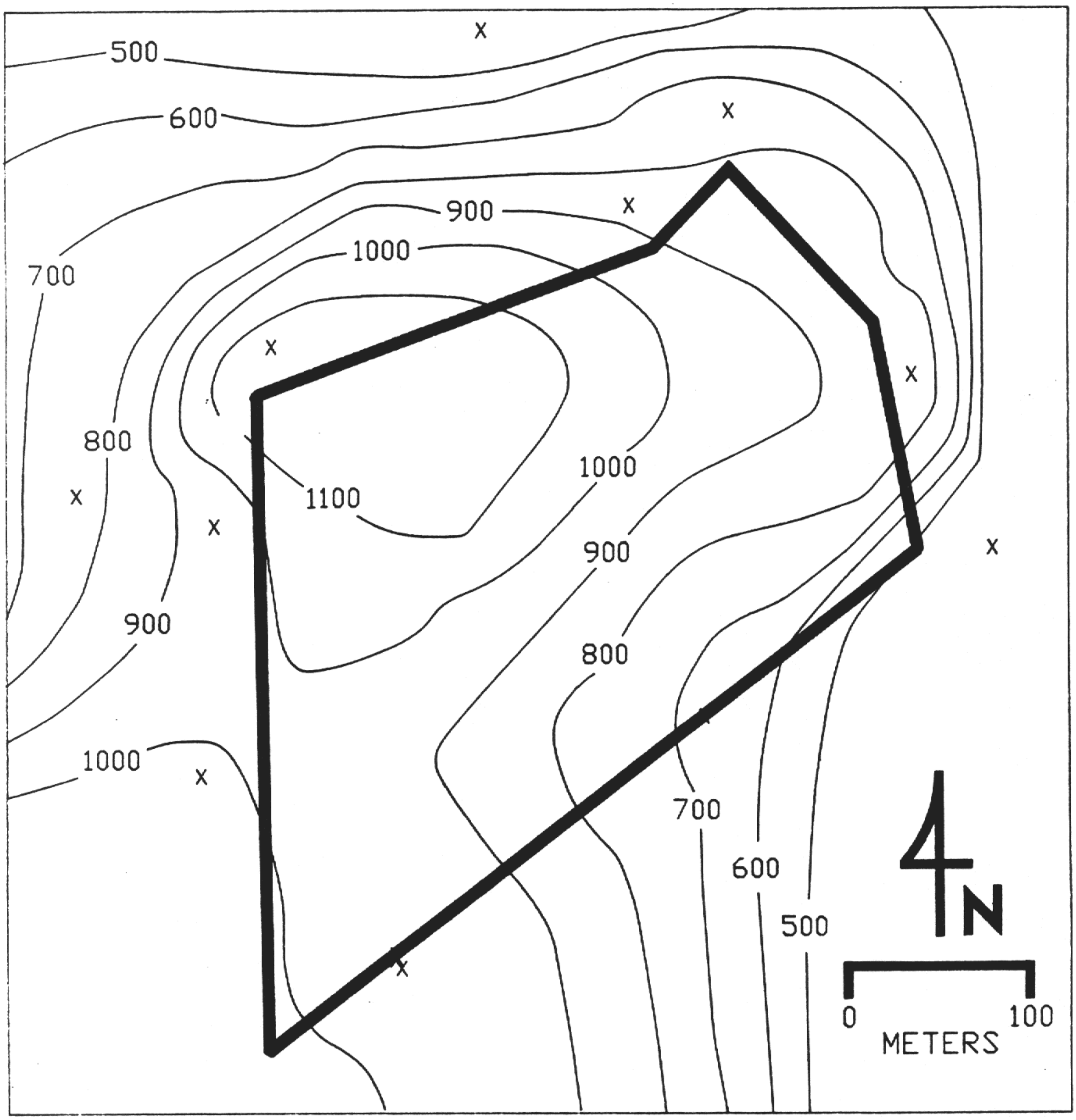
The primary drinking water standard maximum contaminant level (MCL) for chromium is 50 micrograms per liter. This value was exceeded by only two of the 37 samples that were analyzed for chromium. Both of these samples were collected from the same well, OKLFW-34. The higher of the two values was 65.35 micrograms per liter.

The only organic chemical from the primary drinking water standards that was detected was benzene. The maximum contaminant level allowed for benzene is one microgram per liter, all ten of the samples in which benzene was detected had concentrations higher than 1 microgram per liter. The highest concentration of benzene that was detected was 21 micrograms per liter at well OKLFW-34 on April 18, 1985. Samples from the same well that were collected on February 20, 1985, showed no benzene present. The five wells in which benzene was detected in February 1985 showed no traces of benzene during the April 1985 sampling run. Conversely the five wells in which benzene was detected in April 1985 had been free of benzene in February 1985. This indicates that there may be large temporal variations in the concentration of benzene in the monitor wells at the Okeechobee



CONTOUR INTERVAL = 200.00 μMHOS/CM

FIGURE 20 Conductivity Distribution from Monitor Well Samples, April, 1985



CONTOUR INTERVAL = 100 MG/LITER

FIGURE 21 Total Dissolved Solids Concentration from Monitor Well Samples, April, 1985

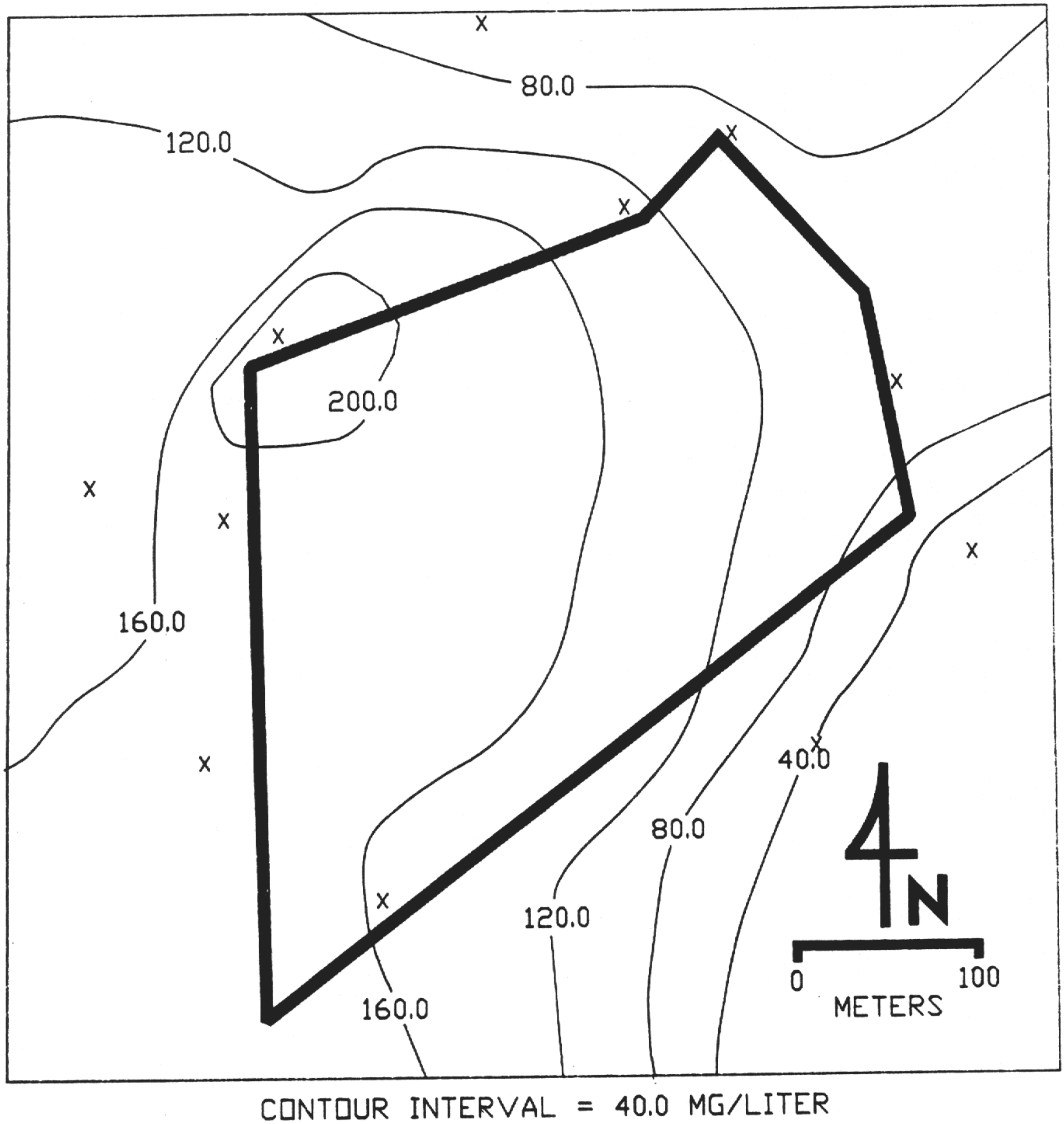


FIGURE 22 Chloride Concentration from Monitor Well Samples, April, 1985

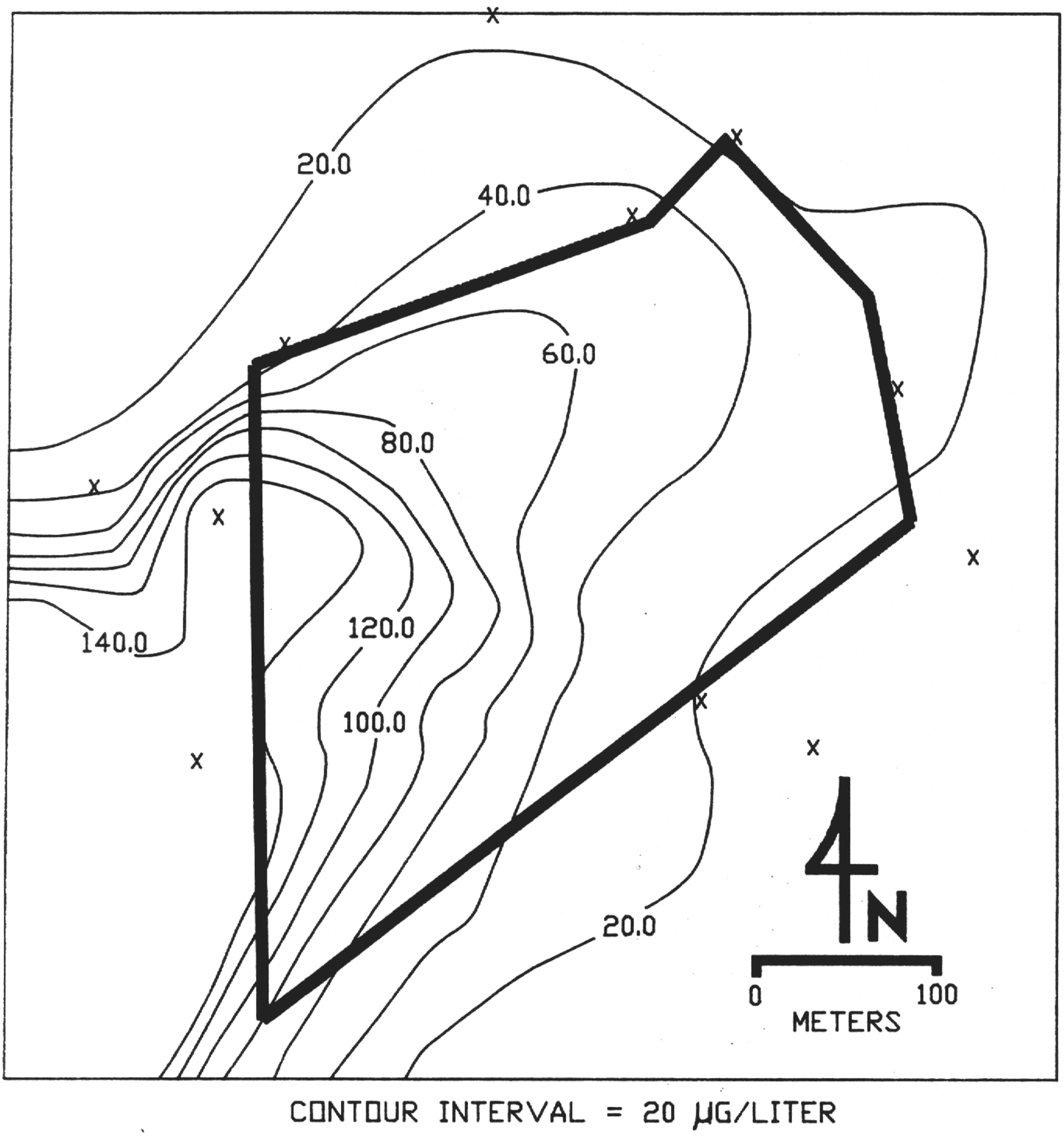


FIGURE 23 Manganese Concentration from Monitor Well Samples, April, 1985

County Airport Landfill. The benzene may leave the landfill in pulses due to variations in rainfall, or the concentrations may vary in a well as the water table elevation moves and exposes the well screen to water from different depths below the water table.

Benzene has been used in a variety of solvents, gasolines and detergents. The wells in which benzene was detected are scattered around the landfill and not concentrated in any one area.

The secondary drinking water standard for TDS is 500 milligrams per liter, 15 of the 21 monitor wells and 26 of 37 samples collected and analyzed exceeded this standard. The highest value of 2121 mg/L is 424 percent of the MCL for TDS.

The secondary drinking water standard for iron is 0.3 milligrams per liter. This level was exceeded by all of the monitor wells on at least one occasion and by 34 of the 37 samples collected. The highest value for total iron was 27.5 milligrams per liter, close to 100 times greater than the MCL.

Eight of the 37 samples analyzed for manganese exceeded the secondary drinking water standard of .05 milligrams per liter. The eight samples that exceeded the standard were from five wells. The highest concentration detected was .634 milligrams per liter, which is 12.7 times greater than the MCL.

In addition to benzene, several other organic compounds were detected in the monitor wells. These compounds are shown in Appendices IIIC and IIID. Purgeable compounds, acid extractable compounds, and base neutral extractable compounds were all detected in samples from the landfill.

The purgeable compounds that were detected include bromoform, chlorobenzene, chloroform, o-dichlorobenzene, and 111-trichloroethane. Ten other compounds were detected with retrofit values of 85 percent or greater. Retrofit compounds are those compounds that were detected even though they were not specifically tested for, the retrofit value gives an approximation of the probability that the compound is present.

Bromoform was detected in only one well, it is used as a solvent. Chlorobenzene was detected in 13 samples, it is used as a solvent in pesticides and in chemical manufacturing. Chloroform was detected in one well at a concentration of 15 micrograms per liter and in two other samples at concentrations below the recognized detection limit for the GC/MS. Chloroform is used in plastics, fumigants, insecticides, refrigerants, and propellants.

O-dichlorobenzene was detected in three wells at concentrations up to 11 micrograms per liter. It has a variety of uses including solvents, fumigants, dyestuffs, insecticides, degreasers polishers, and industrial odor control.

111-trichloroethane was detected in two wells at concentrations of 1.2 micrograms per liter. It is used in pesticides, degreasers, and solvents.

The acid extractable and base neutral extractable compounds that were detected were present in concentrations below the detection limits of the GC/MS. Two of the five acid extractable compounds and all four of the base neutral extractable compounds were retrofit compounds. They were not on the original 130 priority pollutant list.

The three acid extractable compounds from the 130 priority pollutant list that were detected in landfill samples are 2.4 dichlorophenol, pentachlorophenol and 2,4-dimethylphenol. 2,4-dichlorophenol is used for organic synthesis. Pentachlorophenol is used for insecticides, fungicides, bacteriacides, and herbicides. 2,4-dimethylphenol is used in pharmaceuticals, plastics, disinfectants, solvents, dye stuffs, insecticides, fungicides, lubricants, and gasoline additives.

CONCLUSIONS

Both methods of determining leachate plume boundaries employed during this study yielded similar results. Both EM surveys and monitor well sampling offer distinct advantages and disadvantages. The EM survey is inexpensive, rapid, and the results are available almost immediately. It's drawbacks are that it provides only an indication of relative water quality, it does not provide data on the compounds that are present, or their concentrations, and it can be affected by several factors not related to water quality.

The advantage of a monitor well network is that both type and concentration of the compounds present in the monitor well can be determined. The major disadvantage of the monitor well network is cost, both the initial installation expense and the high costs associated with analyzing samples. Ideally both methods can be used in conjunction to maximize the strengths and minimize the weaknesses of each method.

Data collected from the Okeechobee County Airport Landfill shows the ground water quality to be degraded in the vicinity of the landfill with a broad leachate plume moving to the southwest, south, and southeast. Primary and secondary drinking water standards were exceeded by several compounds in the leachate plume. Several toxic compounds were also present in the leachate plume in low concentrations. Defining the exact boundary of this leachate plume would require additional monitor wells. The major concern with the leachate plume is to insure that there is no contamination of drinking water wells.

RECOMMENDATIONS

It is recommended that wells downgradient of the landfill be monitored for benzene, chromium, TDS, iron, and manganese, the compounds that were detected in concentrations exceeding the primary or secondary drinking water standards for the state of Florida. It would also be advisable to sample for toxic compounds such as bromoform, chlorobenzene, chloroform, o-dichlorobenzene, and 111-trichloroethane. It is not possible to determine for certain if the three acid extractable compounds from the priority pollutant list (2.4 dichlorophenol, pentachlorophenol and 2,4-dimethylphenol) are present in the leachate. If they are present, the concentrations are probably extremely low, monitoring for these compounds would be optional.

Ground water modeling of the data collected for this study could be used to predict the future movement and concentration of the contaminate plume. Such an effort would maximize the use of available data and facilitate future sampling efforts and interpretation of any plume movements.

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APPENDIX I

MONITOR WELL CONSTRUCTION

APPENDIX I. MONITOR WELL CONSTRUCTION DATA

Well Number	Total Depth (Feet)	Casing Depth (Feet)	Diameter (Inches)	Type of Casing*	Method of Installation	Elevation of Measuring Point (NGVD)	Latitude	Longitude
W-03	24.0	18.0	2.0	G PVC	Hydraulic Rotary	34.26	271556	805146
W-04	13.0	7.9	2.0	G PVC	Hydraulic Rotary	34.20	271556	805146
W-09	12.5	5.5	2.0	G PVC	Hydraulic Rotary	35.33	271543	805139
W-12	11.0	4.0	2.0	G PVC	Hydraulic Rotary	35.34	271555	805123
W-14	18.6	11.6	2.0	G PVC	Hydraulic Rotary	35.59	271553	805123
W-15	14.4	7.4	2.0	G PVC	Hydraulic Rotary	34.06	271554	805121
W-16	27.0	20.0	2.0	G PVC	Hydraulic Rotary	33.97	271547	805121
OKLFW-27	23.5	18.5	2.0	TPVC	Augered	34.35	271548	805141
OKLFW-29	15.0	10.0	2.0	TPVC	Augered	34.96	271542	805141
OKLFW-30	25.6	20.6	2.0	TPVC	Augered	35.47	271545	805135
OKLFW-31	14.8	9.8	2.0	TPVC	Augered	35.47	271545	805135
OKLFW-32	29.5	24.5	2.0	TPVC	Augered	35.80	271550	805127
OKLFW-33	31.0	16.0	2.0	TPVC	Augered	35.49	271557	805120
OKLFW-34	15.5	10.5	2.0	TPVC	Augered	35.49	271557	805120
OKLFW-35	19.8	14.8	2.0	TPVC	Augered	34.27	271604	805127
OKLFW-36	25.5	20.5	2.0	TPVC	Augered	35.62	271603	805132
OKLFW-37	15.5	10.5	2.0	TPVC	Augered	35.62	271603	805132
OKLFW-38	18.8	13.8	2.0	TPVC	Augered	35.17	271609	805134
OKLFW-39	30.2	25.2	2.0	TPVC	Augered	32.62	271554	815154
OKLFW-40	29.4	19.4	2.0	TPVC	Augered	34.02	271545	805125
OKLFW-41	25.0	20.0	2.0	TPVC	Augered	35.62	271559	805139

*GPVC = Glued PVC
TPVC = Threaded PVC

APPENDIX II

LITHOLOGIC DESCRIPTIONS

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-27

OKEECHOBEE CO. T37S R35E SEC 07BD 27 15 48 N 80 51 41 W
TOTAL DEPTH- 25 FT. ELEV.- 34 FT. 7 SAMPLES- 0- 25 FT.
COMPLETED- 85.02.06 DEPTH WORKED 25 FT.

WELL NAME-OKLFW-27
DRILLED BY SFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFILL

LITHOLOGIC LOG
W-OK-27 .OKEECHOBEE CO. T37S, R35E, SEC 07BD

.0-	5.0	SAND, LIGHT BROWN TO GRAYISH BROWN, 30% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM, ROUNDED, HIGH SPHERICITY, UNCONSOLIDATED, IRON STAIN, 02% CALCITE,
5.0-	10.0	SAND, GRAYISH ORANGE, 30% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE, ROUNDED, MEDIUM SPHERICITY, UNCONSOLIDATED, 02% CALCITE,
10.0-	15.0	SAND, 30% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: FINE TO MEDIUM, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, 02% CALCITE,
15.0-	16.0	CLAY, LIGHT OLIVE, POROSITY, LOW PERMEABILITY,
16.0-	17.0	SHELL BED, WHITE, 05% POROSITY, LOW PERMEABILITY, GOOD INDURATION, 20% QUARTZ SAND,
17.0-	20.0	SHELL BED, WHITE, 10% POROSITY, INTERGRANULAR, MODERATE INDURATION, 15% QUARTZ SAND,
20.0-	25.0	SHELL BED, WHITE, 20% POROSITY, INTERGRANULAR, POOR INDURATION, 10% QUARTZ SAND,
		TD

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-30

OKEECHOBEE CO. T37S R35E SEC 08AC 27 15 45 N 80 51 35 W
TOTALDEPTH- 25 FT. ELEV.- 35 FT. 7 SAMPLES- 0- 25 FT.
COMPLETED- 85.02.04 DEPTH WORKED 25 FT.

WELL NAME-OKLFW-30
DRILLED BYSFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFILL

LITHOLOGICLOG
W-OK-30 .OKEECHOBEE CO. T37S, R35E, SEC 08AC

.0-	5.0	SAND, LIGHT BROWN TO MODERATE BROWN, 25% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM, SUB-ANGULAR, UNCONSOLIDATED,
5.0-	10.0	SAND, LIGHT BROWN TO MODERATE BROWN, 25% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM, SUB-ANGULAR, UNCONSOLIDATED,
10.0-	12.5	SHELL BED, LIGHT YELLOWISH ORANGE TO GRAYISH ORANGE PINK, 02% POROSITY, INTERGRANULAR, GOOD INDURATION, CALCILUTITE MATRIX, EXTREMELY HARD FORMATION, SNAPPED BELL CONNECTOR WHILE DRILLING THROUGH IT
12.5-	15.0	SHELL BED, LIGHT YELLOWISH ORANGE TO GRAYISH ORANGE PINK, 02% POROSITY, INTERGRANULAR, GOOD INDURATION, CALCILUTITE MATRIX,
15.0-	20.0	SHELL BED, VERY LIGHT ORANGE TO WHITE, 20% POROSITY, INTERGRANULAR, POOR INDURATION, 02% QUARTZ SAND, 01% IRON STAIN,
20.0-	25.0	SHELL BED, YELLOWISH GRAY, 10% POROSITY, INTERGRANULAR, MODERATE INDURATION, CALCILUTITE MATRIX, 20% QUARTZ SAND,
		TD

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-32

OKEECHOBEE CO. T37S R35E SEC 08AC 27 15 50 N 80 51 27 W
TOTALDEPTH- 30 FT. ELEV.- 36 FT. 4 SAMPLES- 0- 30 FT.
COMPLETED- 85.01.28 DEPTH WORKED 30 FT.

WELL NAME-OKLFW-32
DRILLED BYSFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFIL

LITHOLOGICLOG
W-OK-32 .OKEECHOBEE CO. T37S, R35E, SEC 08AC

.0-	10.0	SAND, MODERATE PINK TO GRAYISH BROWN, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: MICRO-CRYSTALLINE TO VERY FINE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED,
10.0-	15.0	SAND, VERY LIGHT GRAY TO LIGHT GRAY, 07% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE, ROUNDED, MEDIUM SPHERICITY, UNCONSOLIDATED, 05% LIMESTONE,
15.0-	20.0	SHELL BED, WHITE TO LIGHT GRAY, 30% POROSITY, INTERGRANULAR, UNCONSOLIDATED, 30% QUARTZ SAND, 01% PHOSPHATIC GRAVEL,
20.0-	30.0	SAND, LIGHT GRAY, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: MICROCRYSTALLINE TO FINE, ROUNDED, MEDIUM SPHERICITY, UNCONSOLIDATED, 30% LIMESTONE, 02% PHOSPHATIC SAND,
		TD

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-33

OKEECHOBEE CO. T37S R35E SEC 08DA 27 15 57 N 80 51 21 W
TOTALDEPTH- 30 FT. ELEV.- 35 FT. 6 SAMPLES- 0- 30 FT.
COMPLETED- 85.01.29 DEPTH WORKED 30 FT.

WELL NAME-OKLFW-33
DRILLED BYSFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFILL

LITHOLOGIC LOG
W-OK-33 .OKEECHOBEE CO. T37S, R35E, SEC 08DA

.0-	5.0	SAND, MODERATE BROWN TO MODERATE BROWN, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, IRON STAIN,
5.0-	10.0	SAND, VERY LIGHT GRAY TO YELLOWISH GRAY, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE, ANGULAR, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED,
10.0-	15.0	SAND, GRAYISH BROWN, 15% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO FINE, ROUNDED, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED,
15.0-	20.0	SAND, WHITE TO VERY LIGHT GRAY, 10% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO FINE, ROUNDED, HIGH SPHERICITY, UNCONSOLIDATED, 20% LIMESTONE, 015% PHOSPHATIC SAND,
20.B-	25.0	SAND, VERY LIGHT GRAY TO LIGHT GRAY, 10% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO FINE, ROUNDED, HIGH SPHERICITY, UNCONSOLIDATED, 15% LIMESTONE, 01% PHOSPHATIC SAND,
25.0-	30.0	SAND, WHITE TO MODERATE GRAY, 20% POROSITY, INTERGRANULAR, GRAIN SIZE: MEDIUM, RANGE: FINE TO COARSE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, 40% LIMESTONE, 01% PHOSPHATIC SAND, MOLLUSKS,
		TD

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-36

OKEECHOBEE CO. T37S R35E SEC 08CA 27 16 B3 N 80 51 32 W
TOTALDEPTH- 25 FT. ELEV.- 36 FT. 5 SAMPLES- 0- 25 FT.
COMPLETED- 85.01.30 DEPTH WORKED 25 FT.

WELL NAME-OKLFW-36
DRILLED BYSFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFILL

LITHOLOGICLOG
W-OK-36 .OKEECHOBEE CO. T37S, R35E, SEC 08CA

.0-	5.0	SAND, GRAYISH BROWN RED TO DARK BROWNISH RED, 02% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED,
5.0-	10.0	SAND, DARK YELLOWISH BROWN TO GRAYISH BROWN, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE:. MICROCRYSTALLINE TO FINE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED,
10.0-	15.0	SAND, DARK BROWNISH RED TO YELLOWISH GRAY, B5% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO FINE, SUB-ANGULAR, ROUNDED, MEDIUM SPHERICITY, UNCONSOLIDATED, 01% PHOSPHATIC SAND,
15.0-	20.0	SAND, LIGHT GRAY, 10% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO FINE, SUB-ANGULAR, ROUNDED, MEDIUM SPHERICITY, UNCONSOLIDATED, 05% LIMESTONE, 02% PHOSPHATIC SAND,
20.0-	25.0	SHELL BED, WHITE TO LIGHT GRAY, 20% POROSITY, INTERGRANULAR, UNCONSOLIDATED, 40% QUARTZ SAND, 01% PHOSPHATIC SAND,
		TD

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-38

OKEECHOBEE CO. T37S R35E SEC B8AA 27 16 09 N 80 51 34 W
TOTALDEPTH- 18.7 FT. ELEV.- 35 FT. 3 SAMPLES- 0- 15 FT.
COMPLETED- 85.01.30 DEPTH WORKED 15 FT.

WELL NAME- OKLFW-38
DRILLED BYSFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFILL

LITHOLOGIC LOG
W-OK-38 .OKEECHOBEE CO. T37S, R35E, SEC 08AA

.0-	5.0	SAND, DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN, 02% POROSITY, INTERGRANULAR, GRAIN SIZE: FINE, RANGE: VERY FINE TO MEDIUM, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED,
5.0-	10.0	SAND, VERY LIGHT ORANGE TO LIGHT BROWN, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO FINE, SUB-ANGULAR, ROUNDED, MEDIUM SPHERICITY, UNCONSOLIDATED,
10.0-	15.0	SAND, DARK YELLOWISH BROWN TO MODERATE YELLOWISH BROWN, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: MICROCRYSTALLINE TO FINE, ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, 05% LIMESTONE,
15.0-	18.7	NO SAMPLE,
		TD

APPENDIX II. SOUTH FLORIDA WMD - LITHO LOG PRINTOUT

W-OK-41

OKEECHOBEE CO. T37S R35E SEC B7DB 27 15 59 N 80 51 39 W
TOTALDEPTH- 20 FT. ELEV.- 36 FT. 4 SAMPLES- 0- 20 FT.
COMPLETED- 85.01.31 DEPTH WORKED 20 FT.

WELL NAME-OKLFW-41
DRILLED BYSFWMD;8 INCH HOLLOW STEM AUGER, OKEECHOBEE CO. AIRPORT LANDFILL

LITHOLOGICLOG
W-OK-41 .OKEECHOBEE CO. T37S, R35E, SEC 07DB

.0-	5.0	SAND, MODERATE BROWN TO LIGHT BROWN, 05% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO MICROCRYSTALLINE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, IRON STAIN,
5.0-	10.0	SAND, LIGHT GRAY TO YELLOWISH GRAY, 10% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO MICROCRYSTALLINE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, 01% PHOSPHATIC SAND,
10.0-	15.0	SAND, MODERATE YELLOWISH BROWN TO DARK YELLOWISH ORANGE, 10% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: FINE TO MICROCRYSTALLINE, SUB-ANGULAR, MEDIUM UNCONSOLIDATED
15.0-	20.0	SAND, MODERATE YELLOWISH BROWN TO VERY LIGHT ORANGE, 10% POROSITY, INTERGRANULAR, GRAIN SIZE: VERY FINE, RANGE: VERY FINE TO FINE, SUB-ANGULAR, MEDIUM SPHERICITY, UNCONSOLIDATED, 10% LIMESTONE, 01% PHOSPHATIC SAND,
		TD

APPENDIX III-A

WATER QUALITY DATA

INORGANIC PARAMETERS

APPENDIX III-A. WATER QUALITY DATA, INORGANIC PARAMETERS

Sample Number	Station Code	Date Mo/Da/Yr	Sp Cond µmhos/cm	Lab pH Units	Temp Cent	Na Mg/L	K Mg/L
WQAA-0073	OKLFW-12	12/11/84	269.	6.76	22.1	2.80	0.93
WQAA-0074	OKLFW-14	12/11/84	748.	7.00	23.3	18.90	0.74
WQAA-0075	OKLFW-09	12/11/84	310.	7.22	23.4	70.10	0.40
WQAA-0076	OKLFW-16	12/11/84	523.	7.21	23.0	26.40	0.55
WQAA-0077	OKLFW-15	12/11/84	529.	7.17	23.6	52.40	0.51
WQAA-0078	OKLFW-03	12/11/84	1046.	7.00	23.3	67.40	1.32
WQAA-0079	OKLFW-04	12/11/84	1003.	7.07	22.0	56.80	1.02
WQAA-0093	OKLFW-38	02/12/85	548.	6.91	21.0	16.10	2.06
WQAA-0094	OKLFW-36	02/12/85	1434.	6.71	22.4	69.60	2.94
WQAA-0095	OKLFW-37	02/12/85	5921.	12.33	20.0	65.30	42.21
WQAA-0096	OKLFW-35	02/12/85	1346.	7.71	20.8	86.40	2.47
WQAA-0097	OKLFW-33	02/13/85	1142.	6.69	24.2	28.80	2.35
WQAA-0098	OKLFW-34	02/13/85	2468.	6.84	21.4	89.40	73.68
WQAA-0099	OKLFW-40	02/13/85	674.	7.23	22.0	22.60	1.51
WQAA-0100	OKLFW-30	02/13/85	1740.	6.76	22.0	99.90	6.30
WQAA-0101	OKLFW-31	02/13/85	8281.	12.40	21.0	62.80	159.20
WQAA-0102	OKLFW-39	02/13/85	1426.	7.86	22.3	75.10	2.62
WQAA-0103	OKLFW-32	02/13/85	950.	7.84	23.5	36.50	1.42
WQAA-0104	OKLFW-27	02/13/85	1630.	7.18	21.5	93.90	1.75
WQAA-0105	OKLFW-29	02/13/85	500.	7.68	20.8	109.90	1.81
WQAA-0106	OKLFW-41	04/17/85	1745.	6.89	22.7	112.10	2.78
WQAA-0122	OKLFW-41	04/17/85	1876.	6.59	22.2	109.80	2.81
WQAA-0123	OKLFW-36	04/17/85	1440.	6.69	22.5	68.30	1.95
WQAA-0124	OKLFW-37	04/17/85	2325.	12.06	21.6	30.50	4.89
WQAA-0125	OKLFW-38	04/17/85	529.	8.36	22.2	15.20	1.05
WQAA-0126	OKLFW-39	04/17/85	1445.	7.42	23.0	74.90	0.92
WQAA-0127	OKLFW-03	04/17/85	1200.	7.40	22.2	67.60	1.39
WQAA-0128	OKLFW-27	04/17/85	1633.	7.08	21.9	91.50	1.64
WQAA-0129	OKLFW-35	04/18/85	1190.	7.13	21.9	75.50	1.31
WQAA-0130	OKLFW-33	04/18/85	1334.	7.04	23.9	30.50	2.81
WQAA-0131	OKLFW-34	04/18/85	2032.	6.84	21.5	84.30	88.50
WQAA-0132	OKLFW-16	04/18/85	530.	7.22	23.2	17.60	0.77
WQAA-0133	OKLFW-29	04/18/85	454.	7.32	20.5	15.20	0.34
WQAA-0134	OKLFW-30	04/18/85	1660.	7.07	22.5	98.40	6.13
WQAA-0135	OKLFW-32	04/18/85	1041.	7.08	23.1	38.70	1.19
WQAA-0136	OKLFW-40	04/18/85	650.	7.22	21.4	17.80	0.93
WQAA-0137	OKLFW-31	04/18/85	5611.	12.42	21.9	19.60	14.60

APPENDIX III-A. WATER QUALITY DATA, INORGANIC PARAMETERS

Sample Number	Station Code	Date Mo/Da/Yr	NH_4	OPO_4 Mg P/L	SiO_2 Mg/L	Color Units	T Dis Sd Mg/L
WQAA-0073	OKLFW-12	12/11/84	0.10	<0.004	5.5	101.	167.0
WQAA-0074	OKLFW-14	12/11/84	0.56	<0.004	13.9	142.	722.0
WQAA-0075	OKLFW-09	12/11/84	0.06	<0.004	5.6	75.	207.0
WQAA-0076	OKLFW-16	12/11/84	0.42	<0.004	11.3	135.	324.0
WQAA-0077	OKLFW-15	12/11/84	0.49	<0.004	10.1	183.	353.0
WQAA-0078	OKLFW-03	12/11/84	1.87	<0.004	17.2	1145.	637.0
WQAA-0079	OKLFW-04	12/11/84	0.93	<0.004	13.2	304.	579.0
WQAA-0093	OKLFW-38	02/12/85	0.27	<0.004	18.6		376.0
WQAA-0094	OKLFW-36	02/12/85	0.06	<0.004	18.6		830.0
WQAA-0095	OKLFW-37	02/12/85	7.50	<0.004	12.8		1280.0
WQAA-0096	OKLFW-35	02/12/85	0.59	<0.004	14.6		876.0
WQAA-0097	OKLFW-33	02/13/85	2.23	<0.004	10.0		755.0
WQAA-0098	OKLFW-34	02/13/85	110.75	<0.004	5.7		1030.0
WQAA-0099	OKLFW-40	02/13/85	1.40	<0.004	7.9		434.0
WQAA-0100	OKLFW-30	02/13/85	14.85	0.026	20.3		1033.0
WQAA-0101	OKLFW-31	02/13/85	8.45	<0.004			2121.0
WQAA-0102	OKLFW-39	02/13/85	1.10	<0.004	14.5		1008.0
WQAA-0103	OKLFW-32	02/13/85	0.69	<0.004	10.0		683.0
WQAA-0104	OKLFW-27	02/13/85	3.77	<0.004	14.4		999.0
WQAA-0105	OKLFW-29	02/13/85	0.31	<0.004	6.4		336.0
WQAA-0106	OKLFW-41	04/17/85	7.22	<0.004	12.7		1062.0
WQAA-0122	OKLFW-41	04/17/85	7.98	<0.004	15.6	48.	1158.0
WQAA-0123	OKLFW-36	04/17/85	3.08	<0.004	16.9	30.	865.5
WQAA-0124	OKLFW-37	04/17/85	1.66	<0.004	5.0	62.	613.3
WQAA-0125	OKLFW-38	04/17/85	0.24	<0.004	8.7	174.	343.0
WQAA-0126	OKLFW-39	04/17/85	0.87	<0.004	15.3	80.	950.0
WQAA-0127	OKLFW-03	04/17/85	1.88	<0.004	13.7	109.	774.0
WQAA-0128	OKLFW-27	04/17/85	8.70	<0.004	16.4	59.	1013.0
WQAA-0129	OKLFW-35	04/18/85	1.77	<0.004	12.9	810.	782.0
WQAA-0130	OKLFW-33	04/18/85	3.12	<0.004	10.5	45.	838.0
WQAA-0131	OKLFW-34	04/18/85	24.43	<0.004	5.4	137.	955.0
WQAA-0132	OKLFW-16	04/18/85	0.83	<0.004	8.7	92.	307.0
WQAA-0133	OKLFW-29	04/18/85	0.36	<0.004	11.2	171.	275.0
WQAA-0134	OKLFW-30	04/18/85	10.69	<0.004	14.4	71.	979.0
WQAA-0135	OKLFW-32	04/18/85	0.67	<0.004	9.8	294.	652.0
WQAA-0136	OKLFW-40	04/18/85	0.77	<0.004	9.6	144.	1016.0
WQAA-0137	OKLFW-31	04/18/85	1.33	<0.004	4.0	8.	418.0

APPENDIX III-A. WATER QUALITY DATA, INORGANIC PARAMETERS

Sample Number	Station Code	Date Mo/Da/Yr	F Mg/l	Total As Microg/L	Total Cd Microg/L	Total Cr Microg/L	Total Cu Microg/L
WQAA-0073	OKLFW-12	12/11/84	0.080	5.020	0.880	0.220	2.850
WQAA-0074	OKLFW-14	12/11/84	0.230	1.800	0.540	12.350	6.310
WQAA-0075	OKLFW-09	12/11/84		2.860	<0.100	11.500	1.630
WQAA-0076	OKLFW-16	12/11/84	0.090	1.520	<0.100	0.730	
WQAA-0077	OKLFW-15	12/11/84	0.320	0.550	<0.100	0.400	1.900
WQAA-0078	OKLFW-03	12/11/84	0.240	2.620	0.110	0.790	3.230
WQAA-0079	OKLFW-04	12/11/84	<0.100	1.080	<0.100	6.880	1.770
WQAA-0093	OKLFW-38	02/12/85	2.010	1.540	<0.200	3.000	2.190
WQAA-0094	OKLFW-36	02/12/85	0.036	2.050	<0.200	2.230	1.500
WQAA-0095	OKLFW-37	02/12/85	0.136	3.650	<0.200	1.400	8.350
WQAA-0096	OKLFW-35	02/12/85	0.199	4.390	0.490	17.200	4.560
WQAA-0097	OKLFW-33	02/13/85	0.244	1.580	<0.200	2.870	2.100
WQAA-0098	OKLFW-34	02/13/85	1.084	2.780	<0.200	62.100	9.880
WQAA-0099	OKLFW-40	02/13/85	0.797	2.500	<0.200	13.300	3.740
WQAA-0100	OKLFW-30	02/13/85	0.387	9.140	<0.200	4.950	1.150
WQAA-0101	OKLFW-31	02/13/85	0.203	<1.500	1.440	10.570	15.520
WQAA-0102	OKLFW-39	02/13/85	0.617	29.180	<0.200	0.580	0.720
WQAA-0103	OKLFW-32	02/13/85	0.090	2.390	<0.200	13.800	3.080
WQAA-0104	OKLFW-27	02/13/85	0.995	2.540	<0.200	9.780	<0.400
WQAA-0105	OKLFW-29	02/13/85	0.084	4.600	<0.200	34.100	2.950
WQAA-0106	OKLFW-41	04/17/85	0.471	6.630	<0.200	12.000	4.690
WQAA-0122	OKLFW-41	04/17/85	0.290	6.870	<0.300	20.600	2.220
WQAA-0123	OKLFW-36	04/17/85	<0.100	2.660	<0.300	9.900	<0.200
WQAA-0124	OKLFW-37	04/17/85	0.830	2.160	<0.300	11.180	<0.200
WQAA-0125	OKLFW-38	04/17/85	<0.100	1.910	<0.300	24.850	1.200
WQAA-0126	OKLFW-39	04/17/85	0.210	26.510	<0.300	11.470	<0.200
WQAA-0127	OKLFW-03	04/17/85	<0.100	5.260	<0.300	10.990	<0.200
WQAA-0128	OKLFW-27	04/17/85	<0.100	2.220	<0.300	11.800	1.410
WQAA-0129	OKLFW-35	04/18/85	0.110	5.310	<0.300	15.000	0.310
WQAA-0130	OKLFW-33	04/18/85	<0.100	1.300	<0.300	11.990	0.610
WQAA-0131	OKLFW-34	04/18/85	<0.100	3.390	<0.300	65.350	2.710
WQAA-0132	OKLFW-16	04/18/85	<0.100	2.980	<0.300	11.650	1.810
WQAA-0133	OKLFW-29	04/18/85	0.460	4.740	<0.300	10.400	0.310
WQAA-0134	OKLFW-30	04/18/85	0.590	8.270	<0.300	26.000	2.650
WQAA-0135	OKLFW-32	04/18/85	0.460	2.240	<0.300	11.580	0.850
WQAA-0136	OKLFW-40	04/18/85	0.190	1.410	<0.300	11.650	<0.200
WQAA-0137	OKLFW-31	04/18/85	<0.100	1.110	0.430	10.260	3.920

APPPENDIX III-A. WATER QUALITY DATA, INORGANIC PARAMETERS

Sample Number	Station Code	Date Mo/Da/Yr	Ca Mg/L	Mg Mg/L	Cl Mg/L	So_4 Mg/L	$AlkCaCo_3$ Mg/L
WQAA-0073	OKLFW-12	12/11/84	44.50	2.22	3.9	16.2	139.0
WQAA-0074	OKLFW-14	12/11/84	130.90	4.57	225.0	10.9	87.9
WQAA-0075	OKLFW-09	12/11/84	58.10	3.95	22.3	16.2	127.0
WQAA-0076	OKLFW-16	12/11/84	93.90	2.56	25.3	13.6	235.0
WQAA-0077	OKLFW-15	12/11/84	107.30	2.49	35.9	16.8	259.0
WQAA 0078	OKLFW-03	12/11/84	157.50	8.32	122.0	16.2	333.0
WQAA-0079	OKLFW-04	12/11/84	142.60	8.99	108.0	12.0	382.0
WQAA 0093	OKLFW-38	02/12/85	88.20	3.58	59.5	14.9	169.0
WQAA 0094	OKLFW-36	02/12/85	216.50	9.65	126.0	29.9	112.0
WQAA 0095	OKLFW-37	02/12/85	590.00	<0.20	43.5	22.2	1520.0
WQAA 0096	OKLFW-35	02/12/85	200.50	10.46	102.0	21.3	1010.0
WQAA 0097	OKLFW-33	02/13/85	213.90	3.07	98.3	9.2	474.0
WQAA 0098	OKLFW-34	02/13/85	154.30	33.68	139.0	25.3	1060.0
WQAA 0099	OKLFW-40	02/13/85	111.40	4.76	36.1	9.4	279.0
WQAA 0100	OKLFW-30	02/13/85	242.50	12.82	177.0	17.6	620.0
WQAA 0101	OKLFW-31	02/13/85	756.00	0.09	16.6	5.0	2260.0
WQAA-0102	OKLFW-39	02/13/85	216.50	6.16	188.0	7.6	478.5
WQAA 0103	OKLFW-32	02/13/85	141.30	6.50	105.0	10.8	314.5
WQAA 0104	OKLFW-27	02/13/85	246.50	7.68	170.0	10.3	570.0
WQAA-0105	OKLFW-29	02/13/85	78.50	3.11	17.4	11.2	212.0
WQAA 0106	OKLFW-41	04/17/85	245.00	12.18	199.0	10.3	535.0
WQAA 0122	OKLFW-41	04/17/85	254.00	12.87	219.0	8.9	585.0
WQAA 0123	OKLFW-36	04/17/85	222.00	8.45	128.0	8.5	570.0
WQAA 0124	OKLFW-37	04/17/85	199.00	<0.20	38.0	22.1	525.0
WQAA 0125	OKLFW-38	04/17/85	84.80	3.90	54.0	14.9	174.0
WQAA 0126	OKLFW-39	04/17/85	215.50	6.35	187.0	7.9	462.0
WQAA 0127	OKLFW-03	04/17/85	165.50	9.01	139.0	4.4	394.5
WQAA 0128	OKLFW-27	04/17/85	240.00	7.46	172.0	7.2	585.0
WQAA 0129	OKLFW-35	04/18/85	165.00	9.40	84.2	8.4	488.5
WQAA 0130	OKLFW-33	04/18/85	215.50	2.93	103.0	6.8	498.0
WQAA-0131	OKLFW-34	04/18/85	158.50	31.25	119.0	12.0	1070.0
WQAA 0132	OKLFW-16	04/18/85	89.10	2.34	23.2	8.4	234.0
WQAA 0133	OKLFW-29	04/18/85	72.40	2.81	14.4	9.5	202.0
WQAA 0134	OKLFW-30	04/18/85	227.00	13.01	158.0	8.7	650.0
WQAA 0135	OKLFW-32	04/18/85	170.50	7.31	118.0	10.1	343.5
WQAA 0136	OKLFW 40	04/18/85	113.10	4.02	36.7	11.3	289.0
WQAA 0137	OKLFW-31	04/18/85	505.50	<0.20	18.1	9.9	440.0

APPENDIX III-A. WATER QUALITY DATA, INORGANIC PARAMETERS

Sample Number	Station Code	Date Mo/Da/Yr	TDiss Sr Mg/L	TDiss Fe Mg/L	Total Fe Mg/L	NO_3 Mg N/L	NO_2 Mg N/L
WQAA-0073	OKLFW-12	12/11/84	0.200		2.62	0.005	<0.004
WQAA-0074	OKLFW-14	12/11/84	0.700		14.05	0.007	<0.004
WQAA-0075	OKLFW-09	12/11/84	0.390	0.15	14.22	0.087	<0.004
WQAA-0076	OKLFW-16	12/11/84	0.510	2.96	6.69	0.038	<0.004
WQAA 0077	OKLFW-15	12/11/84	0.360	2.85	9.34	0.087	<0.004
WQAA 0078	OKLFW 03	12/11/84	0.800	3.62	18.17	0.040	0.007
WQAA 0079	OKLFW 04	12/11/84	0.660	3.12	15.64	0.056	0.005
WQAA 0093	OKLFW-38	02/12/85	0.230	3.55	5.98	0.027	0.004
WQAA 0094	OKLFW-36	02/12/85	1.000	0.18	14.33		0.023
WQAA 0095	OKLFW-37	02/12/85	12.500	0.06	0.68	0.036	0.009
WQAA-0096	OKLFW-35	02/12/85	1.010	0.67	2.90		0.032
WQAA-0097	OKLFW-33	02/13/85	0.780	0.20	3.57		0.027
WQAA-0098	OKLFW-34	02/13/85	0.600	0.91	5.16	<0.004	0.022
WQAA-0099	OKLFW-40	02/13/85	0.380	0.95	4.55	0.017	<0.004
WQAA-0100	OKLFW-30	02/13/85	0.870	1.83	0.62		0.100
WQAA-0101	OKLFW 31	02/13/85	30.900	0.08	0.52	0.080	<0.004
WQAA-0102	OKLFW-39	02/13/85	1.100	0.28	13.00		0.062
WQAA-0103	OKLFW-32	02/13/85	0.570	2.47	2.47	<0.004	<0.004
WQAA-0104	OKLFW-27	02/13/85	0.990	1.87	23.14		0.115
WQAA-0105	OKLFW-29	02/13/85	0.420	0.43	0.14	<0.004	<0.004
WQAA-0106	OKLFW-41	04/17/85	1.050	1.40	6.64		0.136
WQAA-0122	OKLFW-41	04/17/85	1.210	15.67	23.75		0.091
WQAA-0123	OKLFW-36	04/17/85	1.320	4.03	8.28		0.011
WQAA-0124	OKLFW-37	04/17/85	1.620	0.04	0.00		<0.004
WQAA-0125	OKLFW-38	04/17/85	0.600	5.95	6.13		0.007
WQAA-0126	OKLFW-39	04/17/85	0.960	9.28	9.27		0.014
WQAA 0127	OKLFW-03	04/17/85	0.840	9.17	10.35		0.014
WQAA 0128	OKLFW-27	04/17/85	0.830	0.41	17.54		0.018
WQAA 0129	OKLFW-35	04/18/85	1.460	0.84	18.71		0.009
WQAA 0130	OKLFW-33	04/18/85	1.010	4.41	0.31		0.005
WQAA-0131	OKLFW-34	04/18/85	0.950	2.96	27.46		0.010
WQAA 0132	OKLFW-16	04/18/85	0.530	0.94	3.79		<0.004
WQAA 0133	OKLFW 29	04/18/85	0.340	2.96	6.53		0.008
WQAA-0134	OKLFW-30	04/18/85	1.380	15.60	23.04		0.027
WQAA-0135	OKLFW-32	04/18/85	0.910	6.26	7.12		0.006
WQAA-0136	OKLFW-40	04/18/85	0.590	2.03	1.16		<0.004
WQAA 0137	OKLFW-31	04/18/85	3.780	<0.05	0.00		<0.004

APPENDIX III-A. WATER QUALITY DATA, INORGANIC PARAMETERS

Sample Number	Station Code	Date Mo/Da/Yr	Total Hg Microg/L	Total MN Microg/L	Total Pb Microg/L	Total Zn Microg/L
WQAA-0073	OKLFW-12	12/11/84	<0.148	20.670	17.820	24.000
WQAA-0074	OKLFW-14	12/11/84	<0.148	18.540	9.860	31.000
WQAA-0075	OKLFW-09	12/11/84	<0.148	8.390	0.900	<20.000
WQAA-0076	OKLFW-16	12/11/84	<0.148	6.210	<1.060	27.000
WQAA-0077	OKLFW-15	12/11/84	<0.148	7.360	0.640	30.000
WQAA-0078	OKLFW-03	12/11/84	<0.148	27.670	2.810	
WQAA-0079	OKLFW-04	12/11/84	<0.148	119.400	3.960	
WQAA-0093	OKLFW-38	02/12/85	<0.158	18.940	10.100	<40.000
WQAA-0094	OKLFW-36	02/12/85	0.235	48.000	2.730	<40.000
WQAA-0095	OKLFW-37	02/12/85	<0.158	2.130	25.190	130.000
WQAA-0096	OKLFW-35	02/12/85	<0.158	31.050	7.740	<40.000
WQAA-0097	OKLFW-33	02/13/85	0.593	22.200	4.930	<40.000
WQAA-0098	OKLFW-34	02/13/85	<0.158	462.000	18.190	164.000
WQAA-0099	OKLFW-40	02/13/85	<0.158	36.700	6.890	45.000
WQAA-0100	OKLFW-30	02/13/85	<0.158	19.200	0.960	<40.000
WQAA-0101	OKLFW-31	02/13/85	<0.158	13.330	10.010	224.000
WQAA-0102	OKLFW-39	02/13/85	<0.158	130.300	<0.800	<40.000
WQAA-0103	OKLFW-32	02/13/85	<0.158	14.610	1.660	<40.000
WQAA-0104	OKLFW-27	02/13/85	<0.158	126.000	1.720	<40.000
WQAA-0105	OKLFW-29	02/13/85	<0.158	48.900	10.930	119.000
WQAA-0106	OKLFW-41	02/12/85	<0.158	31.500	4.490	<40.000
WQAA-0122	OKLFW-41	04/17/85	<0.150	32.900	<1.400	<30.000
WQAA-0123	OKLFW-36	04/17/85	<0.150	45.150	1.990	<30.000
WQAA-0124	OKLFW-37	04/17/85	<0.150	0.550	<1.400	<30.000
WQAA-0125	OKLFW-38	04/17/85	<0.150	16.470	<1.400	<30.000
WQAA-0126	OKLFW-39	04/17/85	<0.150	154.000	<1.400	<30.000
WQAA-0127	OKLFW-03	04/17/85	<0.150	37.800	<1.400	<30.000
WQAA-0128	OKLFW-27	04/17/85	<0.150	175.300	<1.400	<30.000
WQAA-0129	OKLFW-35	04/18/85	<0.150	18.340	<1.400	<30.000
WQAA-0130	OKLFW-33	04/18/85	<0.150	23.280	1.820	<30.000
WQAA-0131	OKLFW-34	04/18/85	<0.150	634.000	11.480	48.000
WQAA-0132	OKLFW-16	04/18/85	<0.150	9.750	<1.400	35.000
WQAA-0133	OKLFW-29	04/18/85	<0.150	68.600	<1.400	45.000
WQAA-0134	OKLFW-30	04/18/85	<0.150	49.850	3.500	33.000
WQAA-0135	OKLFW-32	04/18/85	<0.150	17.680	<1.400	<30.000
WQAA-0136	OKLFW-40	04/18/85	<0.150	18.320	<1.400	<30.000
WQAA-0137	OKLFW-31	04/18/85	<0.150	2.920	2.480	42.000

APPENDIX III-B

WATER QUALITY DATA

TOC RESULTS

APPENDIX III-B. WATER QUALITY DATA TOC RESULTS

Sample Number	Station Code	Date	Total Organic Carbon (mg/L)
WQAA-0073	OKLFW-12	12-11-84	18.2
WQAA-0074	OKLFW-14	12-11-84	17.7
WQAA-0075	OKLFW-09	12-11-84	19.6
WQAA-0076	OKLFW-16	12-11-84	21.4
WQAA-0077	OKLFW-15	12-11-84	21.5
WQAA-0078	OKLFW-03	12-11-84	19.5
WQAA-0079	OKLFW-04	12-11-84	-
WQAA-0093	OKLFW-38	02-12-85	28.0
WQAA-0094	OKLFW-36	02-12-85	42.0
WQAA-0095	OKLFW-37	02-12-85	35.0
WQAA-0096	OKLFW-35	02-12-85	58.0
WQAA-0097	OKLFW-33	02-13-85	17.0
WQAA-0098	OKLFW-34	02-13-85	75.0
WQAA-0099	OKLFW-40	02-13-85	86.0
WQAA-0100	OKLFW-30	02-13-85	88.0
WQAA-0101	OKLFW-31	02-13-85	85.0
WQAA-0102	OKLFW-39	02-13-85	40.0
WQAA-0103	OKLFW-32	02-13-85	72.0
WQAA-0104	OKLFW-27	02-13-85	35.0
WQAA-0105	OKLFW-29	02-13-85	67.0
WQAA-0106	OKLFW-41	02-12-85	44.0
WQAA-0122	OKLFW-41	04-17-85	86.0
WQAA-0123	OKLFW-36	04-17-85	44.0
WQAA-0124	OKLFW-37	04-17-85	22.0
WQAA-0125	OKLFW-38	04-17-85	23.0
WQAA-0126	OKLFW-39	04-17-85	130.0
WQAA-0127	OKLFW-03	04-17-85	59.0
WQAA-0128	OKLFW-27	04-17-85	18.0
WQAA-0129	OKLFW-35	04-18-85	200.0
WQAA-0130	OKLFW-33	04-18-85	140.0
WQAA-0131	OKLFW-34	04-18-85	44.0
WQAA-0132	OKLFW-16	04-18-85	56.0
WQAA-0133	OKLFW-29	04-18-85	12.0
WQAA-0134	OKLFW-30	04-18-85	41.0
WQAA-0135	OKLFW-32	04-18-85	33.0
WQAA-0136	OKLFW-40	04-18-85	70.0
WQAA-0137	OKLFW-31	04-18-85	72.0

APPENDIX III-C

WATER QUALITY DATA

PURGEABLE HALOCARBON RESULTS

APPENDIX III-C. WATER QUALITY DATA PURGEABLE HALOCARBON RESULTS

	DATE SAMPLED DATE ANALYZED WELL NUMBER	2-12-85 2-18-85 OKLFW -38	2-12-85 2-19-85 OKLFW -36	2-12-85 2-19-85 OKLFW -37	2-12-85 2-19-85 OKLFW -35	2-13-85 2-20-85 OKLFW -33	2-13-85 2-20-85 OKLFW -34	2-13-85 2-20-85 OKLFW -40	2-13-85 2-20-85 OKLFW -31
	Purgeable Compound (MDL)								
1	Bromodichloromethane (1)	BDL							
2	Bromoform (1)								
3	Bromomethane (1)								
4	Carbon tetrachloride (1)								
5	Chlorobenzene (1)		2.7	BDL	2.2	BDL	7.2		9
6	Chloroethane (1)								
7	2-Chloroethylvinyl ether (1)								
8	Chloroform (1)		BDL				BDL		
9	Chloromethane (1)								
10	Dibromochloromethane (1)	BDL							
11	Dichlorodiflouromethane (1)								
12	1,1-Dichloroethane (1)								
13	1,2-Dichloroethane (1)								
14	1,1-Dichloroethene (1)								
15	trans-1,2-Dichloroethene (1)								
16	1,2-Dichloropropane (1)								
17	cis-1,3-Dichloropropene (1)								
18	trans-1,3-Dichloropropene (1)								
19	Methylene chloride (1)								
20	1,1,2,2-Tetrachloroethane (1)								
21	Tetrachloroethene (1)								
22	1,1,1-Trichloroethane (1)		BDL	1.2			BDL		
23	1,1,2-Trichloroeathane (1)								
24	Trichloroethene (1)	BDL							
25	Trichloroflouromethane (1)								
26	Vinyl chloride (1)								
27	Dichlorobenzene (1)								
28	0-Dichlorobenzene (1)				2.2		1.1		
29	1,2-Dibromoethane (1)								
+	cis-1,2-Dichloroethene								
+ +	Benzene			1.6				1.4	2.3
+ +	Toluene								BDL
+ +	Ethyl benzene		3						
+ +	p-Dichlorobenzene		BDL	BDL	1.5	BDL	3		1.9
+ +	m-Dichlorobenzene		1.5		2.4				
	Other	+ + +	+ + +	+ + +			+ + +		+ + +

BDL = Positive value below detectable limits
All results in ppb (parts per billion)
+ = Compound not on priority pollutant list
+ + = Analyzed with photoionization detector
+ + + = Several unidentified peaks
Blank spaces indicate compound was not detected

APPENDIX III-C. WATER QUALITY DATA PURGEABLE HALOCARBON RESULTS

	DATE SAMPLED DATE ANALYZED WELL NUMBER	12-11-84 12-13-84 OKLFW- 12	12-11-84 12-13-84 OKLFW- 14	12-11-84 12-13-84 OKLFW- 09	12-11-84 12-13-84 OKLFW- 16	12-11-84 12-13-84 OKLFW- 15	12-11-84 12-13-84 OKLFW- 03	12-11-84 12-13-84 OKLFW- 04
	Purgeable Compound (MDL)							
1	Bromodichloromethane (1)							
2	Bromoform (1)							
3	Bromomethane (1)							
4	Carbon tetrachloride (1)							
5	Chlorobenzene (1)						5	4
6	Chloroethane (1)							
7	2-Chloroethylvinyl ether (1)							
8	Chloroform (1)							
9	Chloromethane (1)							
10	Dibromochloromethane (1)							
11	Dichlorodiflouromethane (1)							
12	1,1-Dichloroethane (1)							
13	1,2-Dichloroethane (1)							
14	1,1-Dichloroethene (1)							
15	trans-1,2-Dichloroethene (1)							
16	1,2-Dichloropropane (1)							
17	cis-1,3-Dichloropropene (1)							
18	trans-1,3-Dichloropropene (1)							
19	Methylene chloride (1)							
20	1,1,2,2-Tetrachloroethane (1)							
21	Tetrachloroethene (1)							
22	1,1,1-Trichloroethane (1)							
23	1,1,2-Trichloroeathane (1)							
24	Trichloroethene (1)							
25	Trichloroflouromethane (1)							
26	Vinyl chloride (1)							
27	Dichlorobenzene (1)							
28	0-Dichlorobenzene (1)							
29	1,2-Dibromoethane (1)							
+	cis-1,2-Dichloroethene							

All results in ppb (parts per billion)
+ = Compound not on priority pollutant list
Blank spaces indicate compound was not detected

APPENDIX III-C. WATER QUALITY DATA PURGEABLE HALOCARBON RESULTS

	DATE SAMPLED DATE ANALYZED WELL NUMBER	2-13-85 2-25-85 OKLFW -31	2-13-85 2-25-85 OKLFW -39	2-13-85 2-26-85 OKLFW -32	2-13-85 2-26-85 OKLFW -27	2-13-85 2-26-85 OKLFW -29	2-12-85 2-26-85 OKLFW -41
1	Bromodichloromethane (1)						
2	Bromoform (1)	1.9					
3	Bromomethane (1)						
4	Carbon tetrachloride (1)						
5	Chlorobenzene (1)	BDL	BDL	1	2.4		5.5
6	Chloroethane (1)						
7	2-Chloroethylvinyl ether (1)						
8	Chloroform (1)						
9	Chloromethane (1)						
10	Dibromochloromethane (1)						
11	Dichlorodiflouromethane (1)						
12	1,1-Dichloroethane (1)						
13	1,2-Dichloroethane (1)						
14	1,1-Dichloroethene (1)						
15	trans-1,2-Dichloroethene (1)						
16	1,2-Dichloropropane (1)						
17	cis-1,3-Dichloropropene (1)						
18	trans-1,3-Dichloropropene (1)						
19	Methylene chloride (1)						
20	1,1,2,2-Tetrachloroethane (1)						
21	Tetrachloroethene (1)						
22	1,1,1-Trichloroethane (1)					1.2	
23	1,1,2-Trichloroeathane (1)						
24	Trichloroethene (1)						
25	Trichloroflouromethane (1)						
26	Vinyl chloride (1)						
27	Dichlorobenzene (1)						
28	0-Dichlorobenzene (1)						
29	1,2-Dibromoethane (1)						
+	cis-1,2-Dichloroethene						
++	Benzene	2.6	BDL		BDL	4	
++	Toluene	BDL				BDL	
++	Ethyle benzene						
++	p-Dichlorobenzene	BDL	BDL	BDL	BDL	BDL	1.3
++	m-Dichlorobenzene						
	Other					+++	

BDL = Positive value below detectable Limits
All results in ppb (parts per billion)
\+ = Compound not on priority pollutant list
++ = Analyzed with photoionization detector
+++ = Several Unidentified peaks
Blank spaces indicate compound was not detected

APPENDIX III-D

WATER QUALITY DATA

GC/MS PRIORITY POLLUTANT RESULTS

APPENDIX III-D. WATER QUALITY DATA

GC/MS PRIORITY POLLUTANT RESULTS

Sample Number Well Number Date	WQAA 0122 OKLFW-41 4-17-85	WQAA 0123 OKLFW-36 4-17-8	WQAA 0124 OKLFW-37 4-17-85	WQAA 0125 OKLFW-38 4-17-85
Purgeable Compounds				
Benzene		7.5		
Chlorobenzene				
Chloroform				15.0
0-Dichlorobenzene	11.0			
Ethanol	R			
Chlorofluorobenzene	R	R		
Methoxyethene	R			
3-Hexanol	R			
1,2-Diethoxyethane		R		
Dichloromethane			R	R
Dimethoxymethane				
1,2-Dimethylbenzene				
Trimethoxymethane				
Pentane				
Acid Extractable Compounds				
2,4-Dichlorophenol	(BDL)	(BDL)		(BDL)
Pentachlorophenol	(BDL)			(BDL)
2,4-Dimethylphenol		(BDL)		
3,4,5-Trimethyl-1-Hexene				
Tetramethylsilane				
Base Neutral Extractable Compounds				
Tetramethylsilane				
Trimethylphenoxyacetic Acid				
1-3-Bis-ethylthiopropane				
3,7,11-Trimethyl-3-dodecanal				

R = Retrofit 85 Percent or Greater Probability that Compound was Present
Blank Spaces Indicate Compound was not Detected
All Results in ppb (Parts Per Billion)
BDL = Positive Value Below Detectable Limit

APPENDIX III-D. WATER QUALITY DATA

GC/MS PRIORITY POLLUTANT RESULTS

Sample Number Well Number Date	WQAA 0126 OKLFW-39 4-17-85	WQAA 0127 OKLFW-03 4-17-85	WQAA 0128 OKLFW-27 4-17-85	WQAA 0129 OKLFW 35 4-18-85
Purgeable Compounds				
Benzene	7.0			
Chlorobenzene	(BDL)	17.0	14.0	
Chloroform				
0-Dichlorobenzene				
Ethanol	R			
Chlorofluorobenzene	R		R	
Methoxyethene				
3-Hexanol			R	
1,2-Diethoxyethane				
Dichloromethane				
Dimethoxymethane			R	
1,2-Dimethylbenzene				
Trimethoxymethane				
Pentane				
Acid Extractable Compounds				
2,4-Dichlorophenol				(BDL)
Pentachlorophenol				
2,4-Dimethylphenol				
3,4,5-Trimethyl-1-Hexene	R			
Tetramethylsilane				
Base Neutral Extractable Compounds				
Tetramethylsilane				
Trimethylphenoxyacetic Acid				
1-3-Bis-ethylthiopropane				
3,7,11-Trimethyl-3-dodecanal				

R = Retrofit 85 Percent or Greater Probability that Compound was Present
Blank Spaces Indicate Compound was not Detected
All Results in ppb (Parts Per Billion)
BDL-Positive Value Below Detectable Limits

APPENDIX III-D. WATER QUALITY DATA

GC/MS PRIORITY POLLUTANT RESULTS

Sample Number Well Number Date	WQAA 0130 OKLFW-33 4-18-85	WQAA 0131 OKLFW-34 4-18-85	WQAA 0132 OKLFW-16 4-18-85	WQAA 0133 OKLFW-29 4-18-85
Purgeable Compounds				
Benzene	6.0	21.0		
Chlorobenzene		23.0		
Chloroform				
0-Dichlorobenzene				
Ethanol		R	R	
Chlorofluorobenzene				
Methoxyethene				
3-Hexanol				
1,2-Diethoxyethane		R		
Dichloromethane				
Dimethoxymethane				
1,2-Dimethylbenzene	R			
Trimethoxymethane		R		
Pentane				
Acid Extractable Compounds				
2,4-Dichlorophenol	(BDL)			
Pentachlorophenol			(BDL)	
2,4-Dimethylphenol	(BDL)			
3,4,5-Trimethyl-1-Hexene				
Tetramethylsilane				
Base Neutral Extractable Compounds				
Tetramethylsilane				
Trimethylphenoxyacetic Acid				
1-3-Bis-ethylthiopropane				
3,7,11-Trimethyl-3-dodecanal				

R = Retrofit 85 Percent or Greater Probability that Compound was Present
Blank Spaces Indicate Compound was not Detected
All Results in ppb (Parts Per Billion)
BDL = Positive Value Below Detectable Limit

APPENDIX III-D. WATER QUALITY DATA

GC/MS PRIORITY POLLUTANT RESULTS

Sample Number Well Number Date	WQAA 0134 OKLFW-30 4-18-85	WQAA 0135 OKLFW-32 4-18-85	WQAA 0136 OKLFW-40 4-18-85	WQAA 0137 OKLFW-31 4-18-85
Purgeable Compounds				
Benzene		6.0		
Chlorobenzene		5.0		
Chloroform				
0-Dichlorobenzene				
Ethanol		R	R	
Chlorofluorobenzene				
Methoxyethene				
3-Hexanol				
1,2-Diethoxyethane				
Dichloromethane				
Dimethoxymethane				
1,2-Dimethylbenzene				
Trimethoxymethane				
Pentane				R
Acid Extractable Compounds				
2,4-Dichlorophenol				
Pentachlorophenol				
2,4-Dimethylphenol				
3,4,5-Trimethyl-1-Hexene				
Tetramethylsilane				
Base Neutral Extractable Compounds				
Tetramethylsilane			R	
Trimethylphenoxyacetic Acid			R	
1-3-Bis-ethylthiopropane			R	
3,7,11-Trimethyl-3-dodecanal			R	

R = Retrofit 85 Percent or Greater Probability that Compound was Present
Blank Spaces Indicate Compound was not Detected
All Results in ppb (Parts Per Billion)
BDL = Positive Value Below Detectable Limit

APPENDIX III-E

GEOTECH INC. WATER QUALITY DATA
FOR THE
OKEECHOBEE COUNTY AIRPORT
LANDFILL MONITOR WELLS

APPENDIX III-E. GEOTECH INC. WATER QUALITY DATA FOR THE OKEECHOBEE COUNTY AIRPORT LANDFILL MONITOR WELLS

Well Number	Date	Sp. Cond. umhos/cm	pH	Temp. Cent.	NO_2 and NO_3 (mg N/L)	Total Fe mg/L	Cl mg/L	COD	Total PB mg/L	Total CU mg/L	Fecal Coliform MPN
W-03	08/15/83	1100	6.8	24	<0.02	16.6	111	67	0.016	0.002	<2
W-03	12/11/84	1000	6.8		<0.008	31.053	94.4	43	0.006	0.017	<2
W-04	08/15/83	810	7.0	25	0.06	42.0	77	103	0.020	0.010	<2
W-04	12/11/84	900	6.9		0.008	28.447	115.9	75	0.019	<0.006	<2
W-09	12/11/84	315	6.9		<0.008	4.608	10.0	84	<0.006	<0.006	<2
W-12	12/11/84	230	7.0		0.01	20.895	5.7	57	0.015	<0.006	5
W-14	08/15/83	400	6.4	28	<0.02	8.54	7.0	55	0.008	0.005	220
W-14	12/11/84	700	7.0		<0.008	22.524	63.7	228	0.038	0.009	<2
W-15	08/15/83	700	6.9		<0.02	8.56	35	62	0.007	<0.001	<2
W-15	12/11/84	550	7.1	27	<0.008	11.394	38.5	57	0.016	0.012	<2
W-16	08/15/83	620	7.0	30.5	<0.02	6.63	30	53	0.006	<0.001	<2
W-16	12/11/84	500	7.2		<0.008	8.408	28.7	102	0.014	<0.006	<2

From Geotech, Inc., West Palm Beach, Florida